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The American Line steamer "New York," on Sept. 14, completed the run from Southampton to New York in 6 d. 7 h. 14 m., beating the best previous record, made by herself, by 1 h. 24 m. The total distance covered was 3,047 knots, and the best daily run was 515 knots. The Cunard steamer "Lucania" also, on Sept. 14, beat the record by making the run from Sandy Hook Light ship to Daunt's Rock, Queenstown, in 5 d. 8 h. 38 m. This is the exact time of her best westward record and beats all runs to the east by over two hours. The "Campania," of the same line, reached New York, on Sept. 14, in 5 d. 9 h. 45 m. from Queenstown. The weather was very favorable for record breaking during these runs.

Work on the elevation of the tracks of the Chicago, Rock Island & Pacific and Lake Shore & Michigan Southern railways, in Chicago, is making very satisfactory progress. The first work done was the construction of a rubble masonry retaining wall along the east side of the right of way from 17th St. to 22d St., about 1,400 ft. This wall contains 5,000 cu. yds. of masonry, and is now practically completed. Work is now well advanced on the masonry abutments for the crossing at Archer Ave., and has begun on the abutments for the 22d St. crossing. Proposals for constructing the superstructure of the Archer Ave. crossing are now being called for, the specifications corresponding exactly to the terms of the ordinance published in Eng. News April 26, 1894. Mr. L. H. Clarke, is the Chief Engineer of the contract work for the two railways, and we are indebted to him for the above information.

Work on the highway and railway bridge being constructed by the St. Paul Belt Line Ry. at South St. Paul, Minn., was commenced Aug. 20. This bridge, including approaches will be about 1 mile long, and will carry an 18-ft. roadway, 16 ft. above the water and a single line of railway track 18 ft. above the wagon floor. There will be six spans to the bridge proper, five 140-ft. truss spans and one 440-ft. swing span. These will be carried on piers of sandstone and granite masonry. The approaches will consist of 30-ft. and 40-ft. steel girder spans carried by braced steel trestle towers, supported on masonry foundations. The total cost of the bridge will be about $160,000, or, including the four miles of railway which is to be built in connection with it, $200,000. The officers of the company are: President, Marcus Johnson; Vice-Pres., Frank P. Blair; Secretary, N. F. Shubert, and Chief Engineer, C. F. Lowett. The Pittsburg Bridge Co., of Pittsburg, Pa., has the contract for the bridge.

A new standard for guard rails was adopted by the New England Roadmasters' Association at its recent annual convention. A committee reported in favor of a guard rail not less than 12 ft. long, straight in the center and with the ends bent in a true curve to give a clearance at each end of 8 ins. The distance from the running side of the frog point to the working side of the guard rail should be 4 ft. 6¾ ins., which will give 1⅝ ins. between the guard rail and the main track rail on a 4 ft. 8½-in. gage track. The convention then voted to adopt as a standard a guard rail 15 ft. long, with 7½ ft. straight at the center, and the ends curved not less than 4 ins., nor more than 5 ins. Not less than five rail braces and two guard rail clamps should be used, and the rail base should be planed enough to permit spikes to be driven between the guard rail and main rail.

The most serious railway accident of the week was the derailment, by a cyclone, of a train on the Cairo branch of the St. Louis, Iron Mountain & Southern Ry., near Charleston, Mo., Sept. 13. The entire train was blown from the track and overturned, two persons being killed, and about 10 injured.——A head collision between a freight train and a light engine running tender first, occurred Sept. 15 near Alpians, N. Y., on the Delaware & Hudson R. R. One man was killed and a number of freight cars were smashed. The engineer of the light engine reversed his engine and jumped, and after the collision the engine ran back several miles before the steam pressure went down.

An explosion of natural gas occurred Sept. 1 under the boilers of the new power house of the Citizens' Ry. Co., of Indianapolis, Ind., and the boilers were thrown from their foundations. Two men were injured.

Two of the 150-ft. spans of the wooden wagon bridge over the Wisconsin River, at Muscoda, Wis., were blown down Sept. 8.

A heavy rainfall occurred at Boston and vicinity on Aug. 20, 1894. We are indebted to Mr. Desmond FitzGerald, M. Am. Soc. C. E., for the following details of this rainfall, taken from the self-recording gage at the Chestnut Hill reservoir of the Boston water-works at Brookline: Rain began at 11:23 a. m. and ended at 3:15 p. m., with a total fall of 1.42 ips. At 12:30 the amount which had fallen was 0.2 in.; at 12:45 it was 0.8 in.; at 1 p. m. it was 1 in.; at 2 p. m., 1.27 in.; at 3:00, 1.38 in., and at 3:15, 1.42 in. The heaviest portion of the rainfall was between 12:30 and 12:45, giving 0.6 in. in 15 minutes, or at the rate of 2.4 ins. per hour. The signal service record, five miles distant, in Boston, gave something over 0.5 in. in five minutes.

A new water supply scheme for Philadelphia is reported as before the common council of that city. This time it is proposed to continue the use of the Schuylkill water, but to draw it from a point further up the river and to purify the whole supply. Additional storage to the amount of 1,600,000,000 gallons and an increase in the pumping capacity to 400,000,000 gallons per day are contemplated, as well as the establishment of suitable plants for purifying and filtering all water pumped at the several pumping stations. As a starter $3,000,000 would be appropriated, this being deemed sufficient for the work to be done in 1895. That an improved water supply is needed in the Quaker city no one will contradict who has seen the water served to consumers there under the best conditions; but such a scheme as is outlined above is not in strict accord with the traditions regarding the city. However, Philadelphia has been discussing a new supply so long that, allowing for its time-honored reputation for slowness, it really may be expected that something will be done between now and the close of the century. A proposition to instruct the Director of Public Works to prepare plans for filtering plants for the whole water supply came near being adopted by the common council, but was finally referred to the council's committee on water.

Bayonne, N. J., has awarded a 25-year contract for a new water supply from driven wells on Staten Island to a company in which Mr. Wm. D'H. Washington, of the Hydraulic Construction Co., New York city, is interested. For years Bayonne has bought water from Jersey City, the quality of which has given great dissatisfaction, to say the least. Under the new contract the city will pay for water on a sliding scale as follows:

Daily consumption, gallons.	Price per million gallons.
Under 2,000,000	$80
2,000,000 to 3,000,000	80
3,000,000 to 4,000,000	70
5,000,000 or over	55

The pressure is to be 45 lbs. per sq. in. at the point of delivery. Bayonne has been paying Jersey City $90 per million gallons.

A 17-in. Harveyized Carnegie armor plate was pierced by two 10-in. Midvale-Holtzer projectiles at Indian Head on Sept. 13. Both shells were fired with the maximum powder charge, but without bursting charges, and developed a velocity of 2,000 ft. per second. One shell was somewhat soft and penetrated only 12 ins.; but the other penetrated 20 ins., perforating the plate. A Johnson cast-steel shell, especially made with a view to piercing Harveyized plates, was also tested on the same 17-in. plate and penetrated 20 ins., indicating that it was probably equal to the Holtzer type of projectile.

The Minnesota Canal Co., of Duluth, has begun condemnation proceedings for its canal from the St. Louis River easterly through St. Louis and Carlton counties, Minn. This project was described at length in Engineering News of April 12, 1894.

The Jersey City Street and Water Board has again made a move for a new water supply, but it seems quite uncertain as to whether anything will result from it, several previous moves having failed to accomplish anything, and the specifications not being opposed by the Mayor as yet. Bids for a new supply will be received until Oct. 22, 1894. The water must be gathered and stored in New Jersey. Preference will be given to the Passaic River, above the Great Falls at Paterson, and any other source must be approved by the board in order to render the bid formal. The supply must not be less than 20,000,000 gallons per day and at the discretion of the board may be as much as 50,000,000 gallons. Water is to be delivered by gravity to the present reservoir and distributing system. The quality of the water must conform with the "Michigan standard," which, we suppose, is that laid down by Prof. V. C. Vaughn, in which the permissible amounts of various substances, in parts per 100,000, are as follows:

Total residue	50
Earthy bases	20
Sodium chloride (about)	1
Sulphates	10
Reduce potassium permanganate	0.8
Free ammonia	0.005
Albuminoid ammonia	0.015
Nitrates	0.050
Nitrites	0.000

The highway swing bridges over the Chicago Drainage Canal, bids for the construction of which are now asked, as noted in our advertising columns, are the first of a considerable number of highway and railway bridges which will have to be built across the canal as the work progresses. The present advertisement calls for three bridges, all highway swing bridges and all crossing rock sections of the canal, which is 162 ft. wide. These bridges will be located at Romeo, Lemont and Willow Springs, respectively. According to the specifications they are to be swing bridges with unequal arms properly counterbalanced, the long arm to be 204 ft. long for bridge No. 1 and 202 ft. long for bridges Nos. 2 and 3, while the short arms of all are to be 100 ft. long. The width c. to c. of trusses is to be 22 ft., the height at the portal 20 ft., and the whole three are to be carried on rim-bearing turntables 20 ft. in diameter, running on 44 20-in. cast iron wheels. The live load provided for is 80 lbs. per sq. ft. on the short arm, and 60 lbs. per sq. ft. on the long arm, or a concentrated load of 8 tons on two pairs of wheels 8 ft. c. to c. of axles. All parts of the bridges are to be of steel, except the flooring, floor stringers and wheel guards. Medium steel is to have a tensile strength of from 62,000 lbs. to 68,000 lbs., and an elongation of 20%, and soft steel a strength of 54,000 lbs. to 62,000 lbs. and an elongation of 25 per cent.

A remarkable feat in long-distance heliograph signaling was accomplished on Sept. 18, messages being successfully transmitted from Mount Uncompahgre, in Colorado, to Mount Ellen, Utah, by the signal corps of Capt. Glassford. The distance is 183 miles, and this feat beats by 58 miles the best previous record for telegraphing by sun-flashes. The greatest previous long-distance signaling was from Lookout Peak to Mount Graham, a distance of 125 miles. Heliograph signals have also been transmitted between the Islands of Mauritius and Reunion, a distance of 117 miles. But the Mauritius mirrors had 12,000 sq. ins. of reflecting surface against 64 sq. ins. for the mirrors of the U. S. Signal Corps.

The use of excursion tickets on the Brooklyn bridge, sold two for 5 cts., the regular tickets being 3 cts., reduced the August receipts over $9,000. The official report of Treasurer Clark shows that in the month 431,496 regular tickets and 1,842,423 excursion tickets were sold. There were 883,140 package tickets sold, ten for 25 cts., but there was a decrease of 145,800 in the sale of these tickets as compared with the preceding month. The movement to introduce 2-ct. fares on the bridge has failed, as it was figured that this meant a reduction of $350,000 in receipts for the year. The total number of passengers carried in the cars in August was 3,157,062, a daily average of 101,841, as compared with 97,509 per day for the preceding month.

A COMPLICATED CROSSING.

We give herewith a diagram of one of the complicated networks of railway tracks for which Chicago is rapidly becoming celebrated, located at Seventy-fifth St., on the South side. An interlocking plant has recently been erected at this point by the Johnson Railroad Signal Co., of Rahway, N. J. The lever frame in the signal tower is claimed to be the largest in this country, having spaces for 132 levers. At present there are 42 spare spaces, but this will soon be required for additional switches and signals. The 90 working levers operate 32 switches and 44 signals, with 28 facing point locks and 10 detector bars. The roads using the crossing are the Chicago Central, Wabash Western, Belt Line, Pittsburg, Cincinnati & St. Louis and Baltimore & Ohio. The interlocking was carried out under the general direction of Mr. E. J. Pearson, Principal Assistant Engineer of the Chicago & Northern Pacific R. R. The plant was first put into service on Jan. 6.

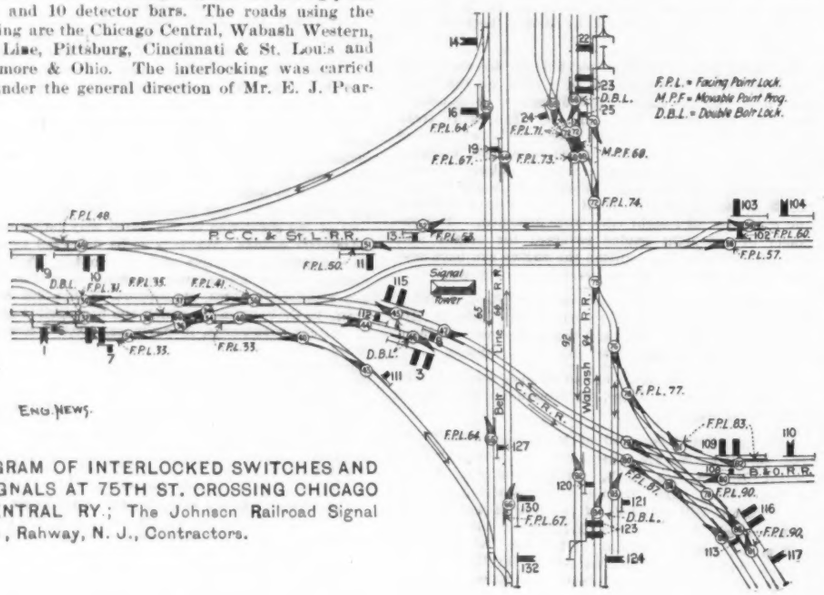


DIAGRAM OF INTERLOCKED SWITCHES AND SIGNALS AT 75TH ST. CROSSING CHICAGO CENTRAL RY.; The Johnson Railroad Signal Co., Rahway, N. J., Contractors.

The crossing is located about nine miles southwest from the center of the city. The number of trains passing the crossing daily was taken last March for seven consecutive days and was as follows:

Date.	No. of trains cross'g.	Date.	No. of trains cross'g.
March 17	189	March 21	201
" 18	132	" 22	197
" 19	157	" 23	194
" 20	206	Average	182.3

The traffic at that time was comparatively light. The force employed in operating the plant consists of three towermen, one for each eight-hour shift; one day repair man, one night repair man and one lamp man. The following figures are given us as the cost of operation per month:

Tower men	$175.75
Repair men, including lampmen	166.85
Interlocking material	62.42
Operating supplies	9.85
Total per month	$414.87
Total per year	4,978.44

THE BATES EARTH-CONVEYOR ON THE CHICAGO DRAINAGE CANAL.

(With Inset.)

In our issue of Sept. 7 we showed, on an inset sheet, the hydraulic dredge at work on Section B of the Chicago Drainage Canal, designed by Mr. Lindon W. Bates, President of the American Hydraulic Dredging Co. We show in this issue a novel earth-conveyor, also designed by Mr. Bates, and now at work on Section G, for which Messrs. Casgrain & McDonald have the contract.

By an error in the "make up," the article describing the dredge, in our issue of Sept. 6, had added to it several photographs referring to the earth-conveyor the significance of which was decidedly obscure in the absence of the illustrations and of the introductory portion of the description. We trust the drawings on our inset sheet in this issue, with the following description, will make clear the ingenious and interesting work which Mr. Bates has accomplished.

The excavation on Section G is wholly of earth, the material is a hard clay, with a slight mixture of sand, breaking up in hard lumps when dug with a steam shovel. The finished canal will be 202 ft. wide on the bottom, with side slopes of 2 to 1.

The conveyor proper consists of three belts, each 22 ins. wide, carried on a series of rollers and driven by engines carried on a car running on a track parallel to and about 40 ft. from the bank of the canal. Beginning at the side of the canal opposite the driving machinery, the first belt runs down the side slope and discharges onto the second conveyor, which runs across the bottom and up the opposite slope to the driving machine. From the driving machine the third belt runs over the spoil bank, where the load is discharged. Of course, the movement of the two belts first mentioned is toward th eengine, and that of the third belt, from the engine.

The system of belts and rollers thus extends transversely across the whole width of the canal, and is carried on a framework of simple construction, which is capable of being moved longitudinally along the canal on a system of tracks. In the first plant erected, the trestlework carrying the belt over the spoil bank was filled in behind and extended as the work proceeded, but in the second plant, which is the one illustrated, and which is now being built, and in such others as will be built hereafter, the belt is carried on a steel truss, extending over the spoil bank. This span will rest on cars at A and B, Fig. 2, which will run on tracks, so that the whole structure can be pulled along as the work proceeds. The conveyor is moved along the canal only a few feet at a time and the movement is effected by means of pinch bars.

Fig. 3 shows the construction of the frame and the rollers carrying the belt. As will be noticed, the upper rollers are concave, while the lower rollers are straight. This gives the belt a trough shape on top and adds to its capacity to carry the material. The rollers are spaced 5 ft. apart c. to c. Along each side of the conveyor is a railing carrying a number of steel plates. On these the workmen scrape adhesive dirt from their shovels when working by hand.

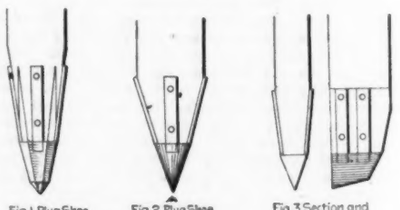
Fig. 5 shows the arrangement of the machinery on the power car. Two 8¼ × 10-in. vertical engines drive two small sprocket wheels, A and B, keyed to the common shaft. One of these sprockets, A, is connected with and drives a large sprocket wheel, A^1, which is fastened to the same shaft as the drum driving the belt down the slope and across the bed of the canal. The other small sprocket wheel, B, is similarly connected with the wheel and drum B^1, which drive the belt extending over the spoil bank. This machinery drives the belt at a speed of about 8 ft. per second, and the earth is deposited on it by hand or machinery and carried along over the spoil bank, where it is scraped off. The scraper or dirt displacer is a ⅜-in. steel plate, clamped diagonally across the belt, as shown in Fig. 4.

Where hand labor is used for excavation, nothing more in the way of machinery is required; but it was desired to do a good part of the work on the section with steam shovels, and it became necessary to devise some means by which the conveyor could be made to transport the dirt delivered by a steam shovel. Of course, emptying the steam shovel directly onto the belt was out of the question. It was necessary to have a "reservoir," which should receive the dirt from the shovel and deliver it in a continuous stream upon the carrying belt. For this purpose a granulator was devised, similar to those used in brick yards, but far stronger and heavier and not designed to break up the earth so finely. The granulator (together with the 30-HP. vertical engine which drives it and a 40-HP. vertical boiler) is mounted on a car, which runs on a track laid across the bottom of the completed excavation at right angles to the axis of the canal. The granulator car straddles the lower section of the conveyor belt and is moved along on its track as the steam shovel advances. The illustration shows several successive positions of the steam shovel and the swing of its dipper. The shovel excavates from the surface of the cut, running from the south to the north over a 30-ft. radius curve and a movable track. When the shovel has gone half way to the north berme of the canal, the curved track is moved into position for the new cut, and the straight track on which the shovel travels northward is shifted to connect with the curve in its new position. In a similar manner the track on which the granulator car runs is shifted, one end being moved to a new position while the car is at the other end.

The engine and granulator are coupled with a friction clutch, so that large stones, stumps or other obstructions dropped into the granulator will merely stop it without causing breakage. This apparatus has been in operation but a short time, but we are informed that it has already demonstrated its capacity to handle 125 cu. yds. of earth per hour, and that the conveyor belt has delivered this amount on the spoil bank without difficulty.

CAST IRON PILE SHOES WITH CHILLED POINTS.

We illustrate herewith some new patterns of cast iron shoes for piles, which any contractor or engineer driving piles in difficult ground will find of interest. The plug shoes, Figs. 1 and 2, are attached to the pile tip by four straps, as shown, spiked to the pile. They are made in a variety of dimensions and in weights from 14 lbs. up to 212 lbs. The sheet shoes, Fig. 3, are intended for cofferdam work or for wide squared piles, and are made in weights from 17 lbs. to 142 lbs. The points of both plug and sheet shoes are chilled and the metal is cast around the straps. Piles so shod will pierce ground against which an ordinary pile would go to pieces. They are especially desirable for dock and harbor work, where obstructions are likely to be encountered. In some work at Philadelphia, piles 6 to 8 ins. in diameter, with 14-lb. shoes, have been driven through an old crib, a very severe test. These shoes are being placed on the market by Messrs. J. M. Mays & Co., 209 Walnut Place, Philadelphia.



Cast Iron Pile Shoes with Chilled Points.

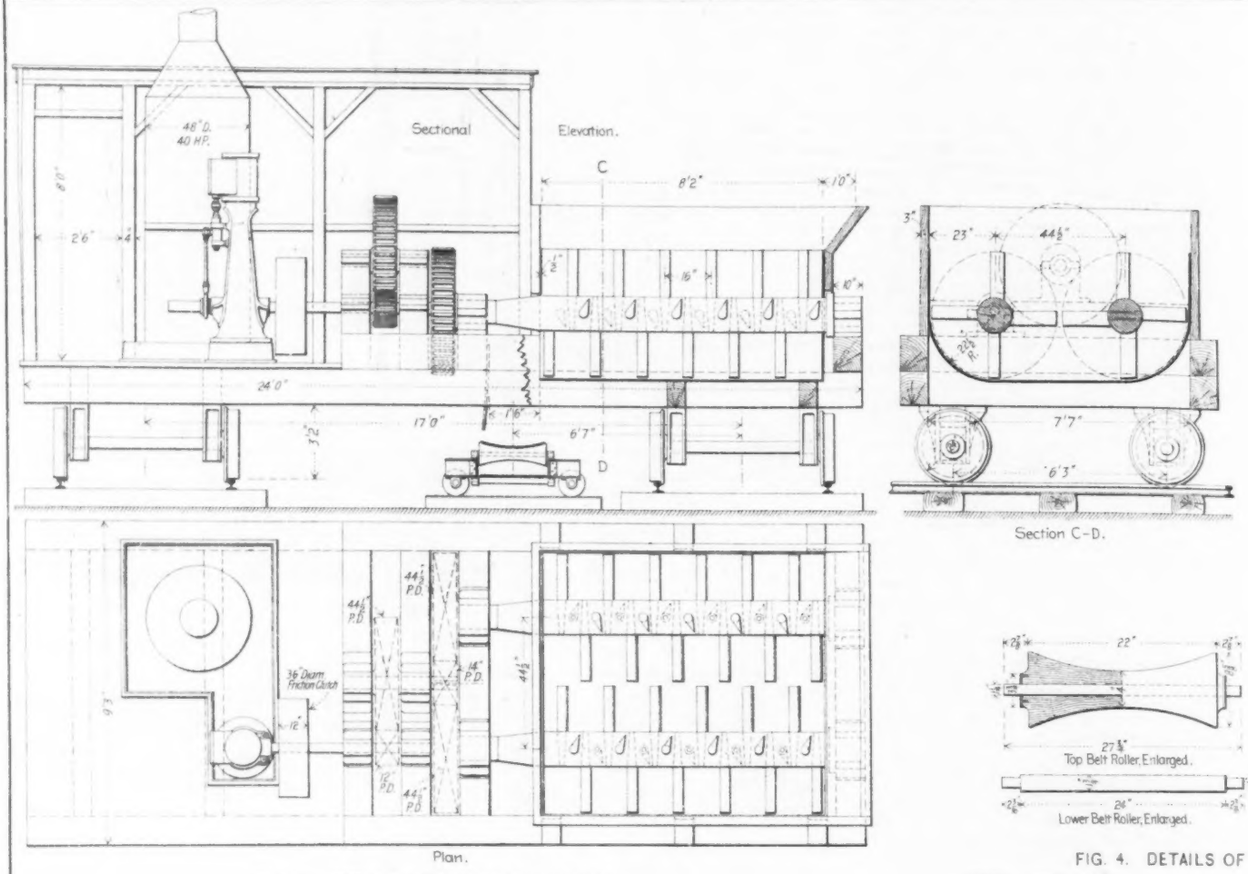


FIG. 7. DETAILS OF DRAKE GRANULATOR.

FIG. 4. DETAILS OF ROLLERS AND BELT

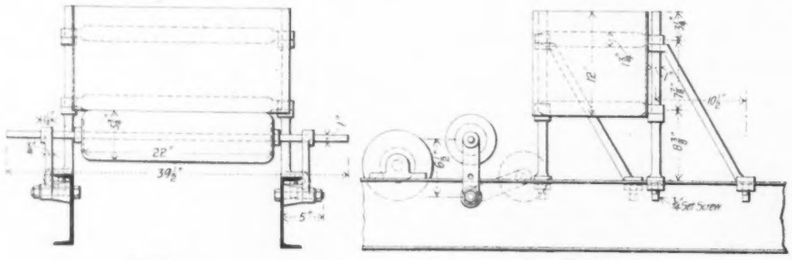


FIG. 5. DETAILS OF DIRT DISPLACER.

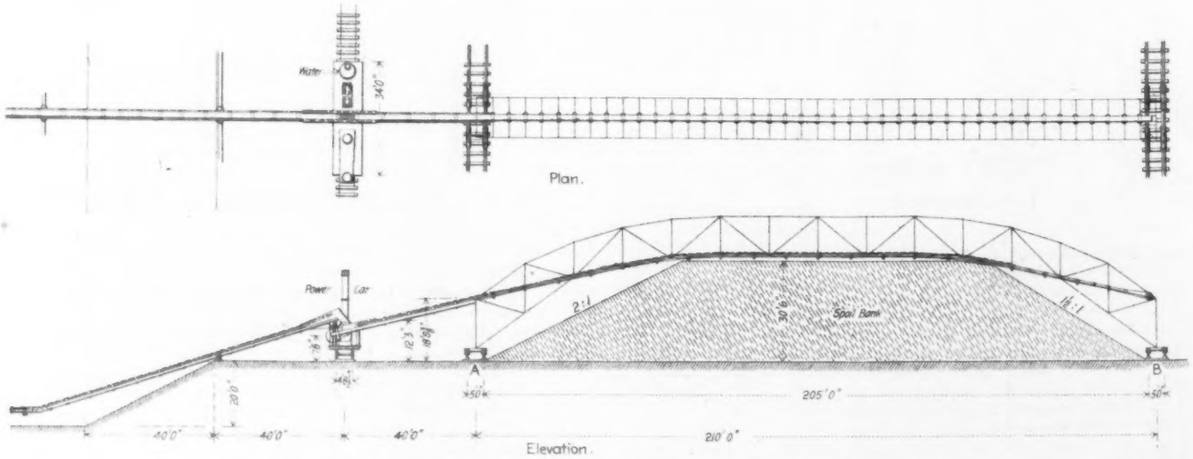


FIG. 2. PLAN AND ELEVATION OF CONVEYOR OVER SPOIL BANK.

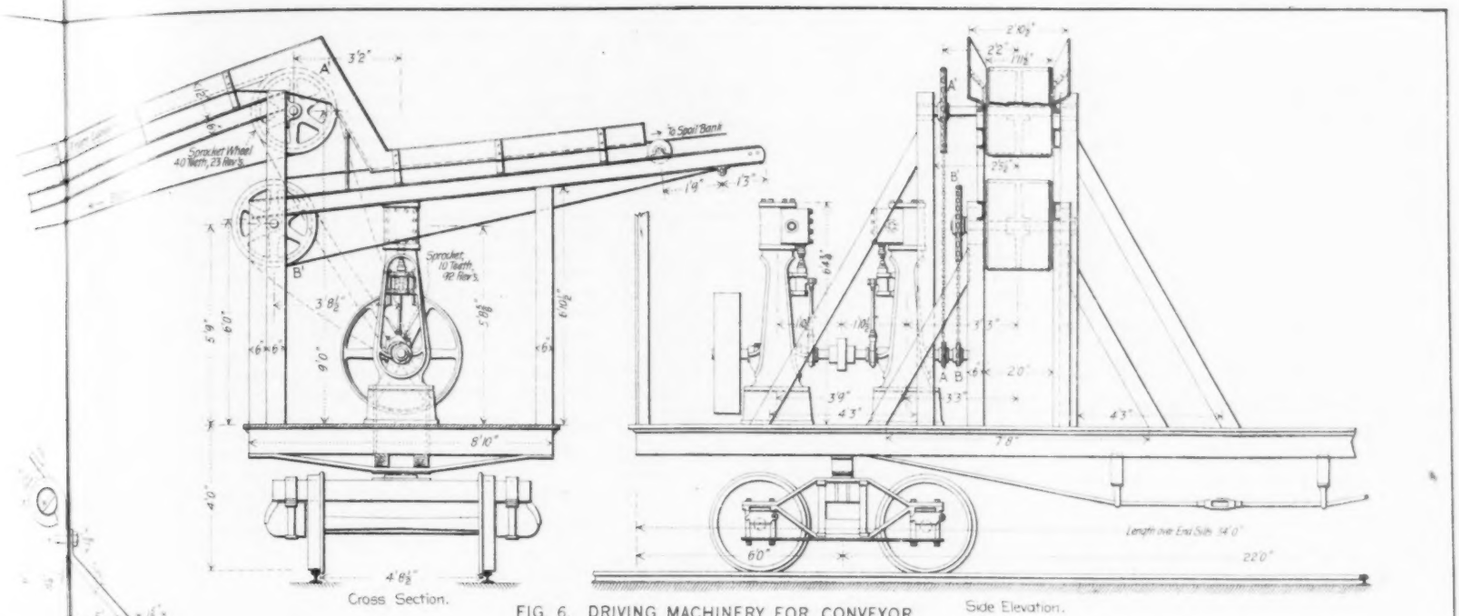
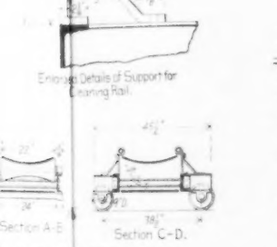


FIG. 6. DRIVING MACHINERY FOR CONVEYOR.



S AND BELT FRAME.

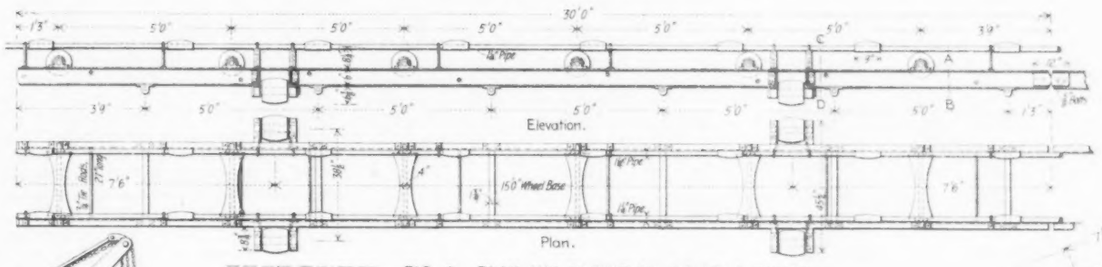
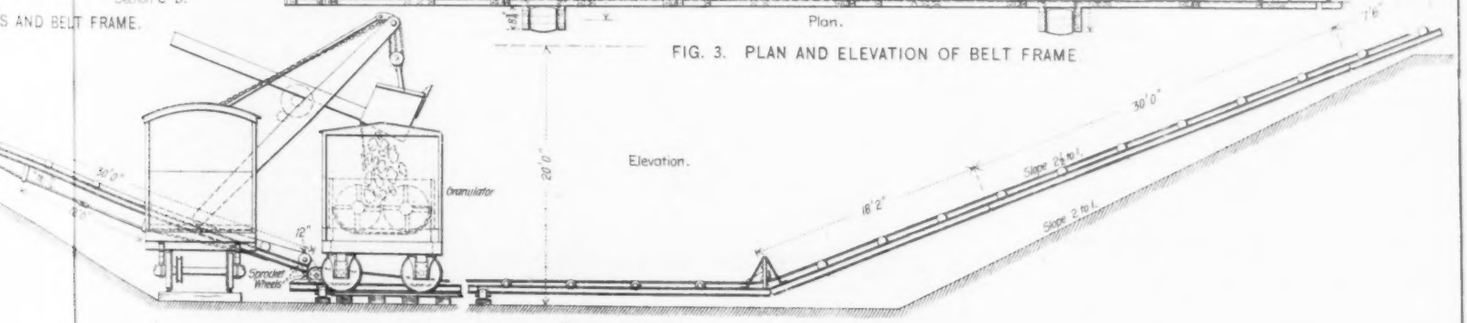
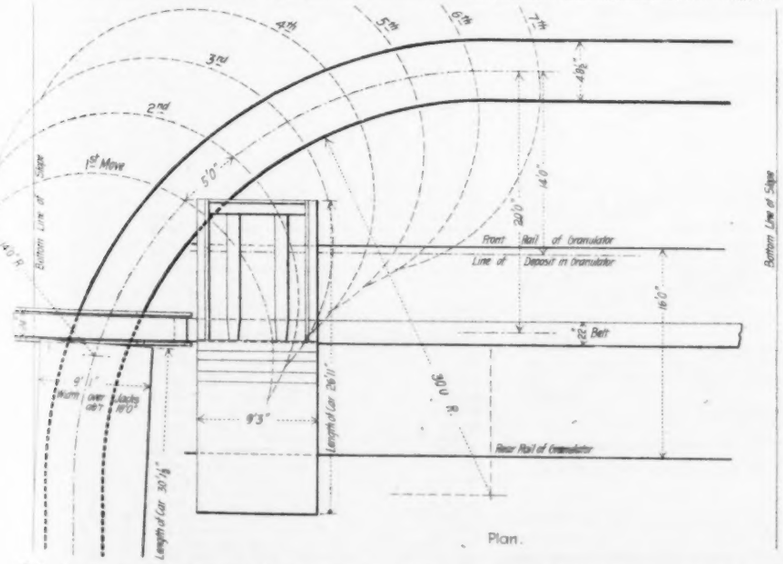


FIG. 3. PLAN AND ELEVATION OF BELT FRAME





EARTH CONVEYOR

FOR THE

CHICAGO DRAINAGE CANAL.

Lindon W. Bates, Designing Engineer.
The Bates Conveyor Co., Chicago, Builders.

FIG. 1. PLAN AND ELEVATION OF STEAM SHOVEL, GRANULATOR AND CONVEYOR IN CANAL.

CHAS. HART & SONS, LITH., 34 VESEY ST., N. Y.

NEW PUMPING ENGINES FOR THE CHICAGO WATER-WORKS.

As was briefly noted in our last issue, the much-needed additions to the pumping capacity of the Chicago water-works system have been definitely decided upon, and proposals are asked for the construction of the necessary machinery. The new pumping engines will in part replace old pumps of small capacity, which have become inadequate to the present demands, and in part supplement existing pumps of more recent construction. The new pumps will be five in number, will have an aggregate capacity of 88,000,000 gallons in 24 hours, and will be located as follows: One vertical triple-expansion engine of 30,000,000 gallons capacity at the 14th St. station, two vertical compound engines of 15,000,000 gallons capacity each at the Chicago Ave. station, and two horizontal four-cylinder compound engines of 14,000,000 gallons capacity each at the Lake View station and at the 68th St. station respectively.

The duties required of each engine, the maximum boiler pressure permitted and the maximum piston speed and length of stroke are shown in the accompanying table. Best quality Lehigh anthracite

Requirements of Specifications for New Chicago Pumping Engines.

Station.	No. of engines.	Daily capacity, gallons.	Duty required, ft.-lbs. per lb. Lehigh anthracite.	Max. boiler pressure, lbs.	Max. pis-ton speed, ft. per min.	Max. stroke of pis-ton, ft.
14th St.....	1	30,000,000	1,300,000	120	200	5
Chicago Ave.	2	15,000,000	1,150,000	...	185	5
Lake View..	1	14,000,000	1,100,000	80	130	..
68th St.....	1	14,000,000	1,100,000	80	130	..

is to be used in making duty tests, and these shall be made in a manner satisfactory to the city's representatives. The engines must be able to run at a piston speed 10% higher than the maximum provided for without injury. The boilers are to be of the return-tubular type and so piped as to permit the cutting out of any boiler for repairs, surplus capacity in the boiler plant being specified. The foundations are to be erected by the city, but the contractor has to remove the old engines at the Chicago Ave., 68th St. and Lake View stations, and they will become his property.

In presenting bids, general drawings of the engines must be furnished. The successful bidder is required to have the work completed 18 months from the date of the execution of the contract. The following is an extract from the specifications for material to be used in the machinery:

Iron castings for beds and frames shall be of tough, gray iron, free from cold shuts or other injurious defects, true to form and thickness, and of workmanlike finish. Sample pieces of 1 in. square cast from the same heat of metal in sand molds shall be capable of sustaining on a clear span of 4 ft. 6 ins. a central load of 500 lbs. when tested in the rough bar. A blow from a hammer shall produce an indentation on a rectangular edge of the casting without flaking the metal. In addition to the above tests, iron for cylinders, valves and other important parts shall stand a tensile strain of 24,000 lbs. per sq. in., and shall show in fracture a clean, close gray iron.

Steel castings shall be free from blowholes, true to pattern, have a smooth and workmanlike finish, and must be properly annealed. Sample bars cast from each melt, after being properly prepared, shall be tested and must show an ultimate strength of at least 57,000 lbs. per sq. in., elastic limit of at least 30,000 lbs. per sq. in., elongation of at least 25% in 8 ins., and reduction at point of fracture of at least 25%. Bronze or brass is to be made of new material, and must be free from flaws, blowholes and mechanical imperfections, and must conform to dimensions shown on the approved drawings. Sample bars cast from same heat shall be broken to ascertain the uniformity of the grain of the metal. When the castings are being machined, if the metal shows signs of imperfect mixing the copper or other component parts being separated, it will be rejected.

All wrought iron must be tough, ductile, fibrous and of uniform quality; well welded, smooth and free from cinder pockets or injurious flaws, buckles, blisters or cracks. All wrought iron intended as rods, bolts, clamps, keys or similar parts shall have an ultimate strength of not less than 50,000 lbs. per sq. in., elastic limit of not less than 30,000 lbs. per sq. in., and elongation of at least 20% in 8 ins. All fractures must show fibrous structure, and the iron must be capable of being bent to 180° about a curve whose diameter is equal to the thickness of the piece tested.

Dimensions and forms of forgings must be strictly in accordance with approved drawings, and they must be thoroughly welded and free from all mechanical defects. If iron forgings are made from "scrap," it must be strictly No. 1 and well tumbled to remove all dust before piling. If made from "new iron," the muck bar must have received at least one thorough re-working before piling. The manner of working the above material and the size of hammers used in making the forgings must be approved by the City Engineer, or his representative. If steel forgings are used, the clauses in relation to the size of the hammers and method of working shall apply as above. The steel shall not contain over 0.05% phosphorus, of 0.03% sulphur. If phosphorus is up to the limit given, the carbon shall not exceed 0.22%, but if phosphorus is reduced so as not to exceed 0.035%, the carbon may be increased not to exceed 10 points. The City Engineer, or his representative, shall have authority to pass upon the size of ingots, blooms or billets from which the forgings shall be made.

The shells, domes, heads and drums of boilers shall be constructed of homogeneous steel made by the acid open hearth process, and shall have the following properties and be of good finish and of uniform quality. The ultimate tensile strength shall not be less than 55,000 nor more than 62,000 lbs. per sq. in. The elastic limit shall not be less than 32,000 lbs. per sq. in., with an elongation in 8 ins. of not less than 25%; the test sections shall have planed or milled edges, with a cross sectional area of not less than ½ sq. in. All steel must stand hot or cold bending double and hammering down on itself without showing signs of distress, and must be capable of withstanding the usual punching and drifting tests. When a sample is broken after being nicked, the appearance of laminations or cold shuts or other imperfections, will cause the rejection of the plates. All tests shall be made at the steel mills by such inspectors as the City Engineer may appoint, and the contractor shall provide and prepare, under his directions, such samples from each plate as is necessary to determine its quality, and the contractor shall also give the inspector all requisite assistance without extra cost. The city also reserves the right to make chemical tests of the material, and if this shows more than 0.04% of phosphorus, or more than 0.03% sulphur, the plates will be rejected. Each sheet used in the construction of the boilers shall have the maker's name and the inspector's stamp on the outside.

The estimated cost of the new engines and boilers is about $495,000. We are indebted to City Engineer S. G. Artingstall for the matter from which this brief description of the proposed work has been prepared.

SOME STANDARD TRACK TOOLS.

At the annual convention of the Roadmasters' Association of America, held in New York last week, the committee on standard track tools presented a report (abstracted in our report of the proceedings elsewhere) recommending standard forms for four track tools, and these were adopted by the

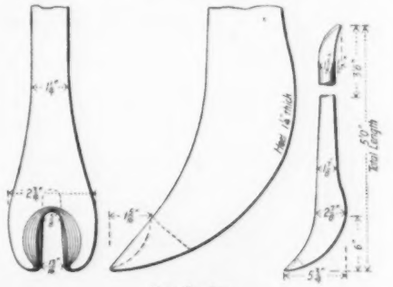


Fig. 1. Clawbar.

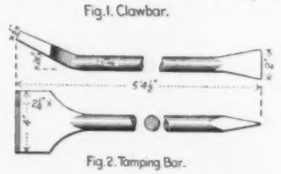


Fig. 2. Tamping Bar.

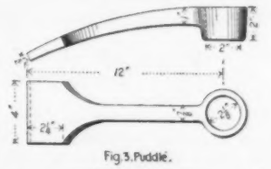


Fig. 3. Puddle.

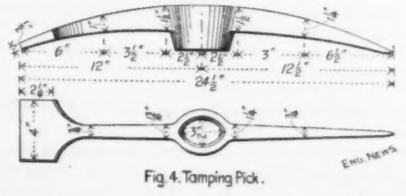


Fig. 4. Tamping Pick.

Standard Forms of Track Tools as Adopted by the Roadmasters' Association of America, 1894.

association. In preparing these standards, originals were made from the designs of the committee (after practical tests) by the Verona Tool Works, of Pittsburg, Pa. All the tools are made of steel.

The clawbar, Fig. 1, is 5 ft. long, weighs 30 lbs., and has a curved chisel point at the upper end of the handle. The tamping bar, Fig. 2, is 5 ft. 4½ ins. long, ⅞ in. diameter and has a flat chisel edge at the upper end; its weight is 13½ lbs. The puddle for gravel and other light ballast, Fig. 3, resembles the half of an ordinary tamping pick and weighs 5 lbs. A pick eye can be used if desired instead of the circular eye shown. The tamping pick is 24½ ins. long over all and weighs 8½ lbs.

IRON AND STEEL STATISTICS FOR 1893.

The annual statistical report of the American Iron and Steel Association for the year 1893 has been issued, and from it the following general facts may be gleaned relating to the American and foreign iron industry for the past year:

As a preliminary statement it may be said that the check to industrial prosperity, following the flush years of 1889-1890, was continued throughout 1893 and through the first six months of 1894 covered by the report. In Great Britain and on the Continent these conditions are most evident in a reduction of prices, though there has also been a marked decline in production in England for the years 1893 and 1894.

The condition of the iron and steel industry and the trades dependant upon them in the United States and Great Britain for the years 1892 and 1893, and for the chief items only, can be best seen in the following table, arranged from the text of the report:

	U. S.		Great Britain.	
(Gross tons.)	1892.	1893.	1892.	1893.
Coal produced	160,115,242	162,814,977	181,786,871	164,325,795
Iron ore produced	16,296,036	11,587,629	11,312,675	11,203,476
Iron ore imported.	806,585	526,954	3,780,503	4,065,864
Pig iron produced	9,157,000	7,124,502	6,709,225	6,976,930
Pig iron in stock..	506,116	662,068	872,035	868,730
Bessemer st'l ingots	4,168,435	3,215,686	1,500,810	1,493,354
Bessemer st'l rails.	1,537,588	1,120,400	535,836	579,386
Open he'th steel ...	993,889	737,800	1,418,830	1,456,369
Total steel production	.....	4,019,995	.....	3,049,663
Coke produced (net tons.....	12,010,289	9,477,580	.....	.....

The shipment of iron ore from the Lake Superior region in 1893 amounted to 6,060,492 tons, against 9,069,556 tons in 1892, a decrease of 3,009,064 tons from this region alone. The decrease noted in pig iron productions was almost entirely in the second half of 1893; the decline in this half year amounted to nearly 44%. The production for the first half of 1894 was but slightly in excess of that of the last half of 1893, and the year ending June 30, 1894, shows the lowest produciton of pig iron since the dull year of 1885.

The production of all kinds of steel rails in this country, including Bessemer and open-hearth steel and iron rails, was 1,136,458 gross tons, a decline of 415,386 tons from the total product of 1892 and the smallest output since 1885. This is partly accounted for by the fact that only 2,828 miles of new railways were constructed in 1893, against 4,648 miles in 1892. The new railway mileage of 1893 was the smallest since 1878; but in the first half of 1894 only 525 miles have been built.

The decrease in production, or in demand, has had a marked influence upon prevailing prices, as is shown in the following table, giving the average yearly prices per ton of 2,240 lbs., and for bar iron per 100 lbs.; these prices are obtained by averaging monthly prices:

Articles.	1873-9 $	1884-5 $	1891-4 $
Old iron T-rails, at Philadelphia..	25.18	22.05	19.48
No. 1 anth. foundry pig, at Phila.	18.40	17.52	15.75
Gray forge pig iron, at Phila....	15.82	14.52	13.54
" " Lake ore, at Pittsburg..	15.78	14.06	12.81
Bessemer pig iron, at Pittsburg..	18.85	15.95	14.37
Steel rails, at mills, Penna.....	31.75	29.92	30.09
Steel billets, at mills, Pittsburg..	30.52	25.32	23.63
Best refined bar iron, store, Phila.	2.05	1.90	1.87
All muck bar iron, Pittsburg....	1.85	1.71	1.64
Wire nails, per 100 lbs., Chicago.	2.51	2.05	1.70

	1873-9 $	1884-5 $	1891-4 $
	16.43	15.75	14.52
	12.73	11.77	12.87
	28.12	20.44	1.70
	1.50	1.49	

Since the close of the civil war there have been three periods of particularly low prices for iron and steel in this country. The first occurred after the panic of 1873, the second in 1884-95 and the third in 1891-94. The comparative lowest prices quoted in each of these three periods is given as

follows per ton of 2,240 lbs. and for 100 lbs. of bar iron:

Articles.	1873- 9 $	1884- 5 $	1891- 4 $
No. 1 anthracite foundry pig, Phila.	16.50	17.50	12.50
Gray forge pig, Lake ore, Pittsburg.	16.00	14.00	9.40
Bessemer pig, Pittsburg	19.50	17.00	10.45
Old iron rails, Philadelphia	18.00	16.50	11.00
Best bar iron, Pittsburg	1.60	1.50	1.20
Steel rails at mills, in Penna	40.00	26.00	24.00

The lowest price of No. 1 anthracite foundry pig iron quoted above for the first period, $16.50, was in November, 1873, immediately following the panic of Sept. 18, 1873, when the iron trade was in a state of complete prostration. But the lowest price for the same iron in 1893 was $13.75, on a quotation ruling through November and December of that year, and in April, May, June and July of 1894 the price fell still further to $12.50. The prices of Lake Superior iron ore also fell off at a corresponding rate. These prices were for season contracts for ore delivered at lower ports on Lake Erie, and are given for the principal mines, in tons of 2,240 lbs., as follows:

Grades.	1889. $	1890. $	1891. $	1892. $	1893. $	1894. $
Republic and Champion, No. 1	5.50	6.50	5.50	5.50	4.50	3.35
Specular No. 1, non-Bessemer	5.00	6.00	5.00	5.00	4.00	3.00
Chapin	4.50	5.50	4.25	4.25	3.65	2.50
Soft hematite, No. 1, non-Bessemer	3.75	4.50	3.75	3.75	3.25	2.00
Gogebic, Marquette and Menominee, No. 1, Bessemer hematite	5.00	6.00	4.75	4.50	4.00	2.75
Minnesota, No. 1, Bessemer	5.50	6.50	5.50	5.65	4.50	3.35
Minnesota, No. 1, non-Bessemer	...	...	...	4.85	4.00	3.00
Chandler, No. 1, Bessemer	...	...	...	4.85	3.90	2.95

In addition to these low prices for 1893-94 large quantities of No. 1 Mesabi iron ore have been sold at lower lake ports this year at $2.50 per ton, and No. 2 Mesabi iron ore at $2.25 per ton. It is well to mention that these prices include the mining of the ore, its handling and transport by rail about 100 miles to the lake, nearly 900 miles of lake transportation and unloading on dock at port of delivery.

The exports of domestic iron and steel manufactures from the United States to all foreign manufacturers were valued at $30,159,150 in 1893, against $27,900,862 in 1892. In these exports cut nails and spikes form the chief item, the valuation being $10,512,576 in 1893 and $10,348,675 in 1892. Agricultural implements come next, with $5,191,223, and then come sewing machines with $2,456,487, both of the latter for 1893.

Pig iron was produced in 23 states in 1893, the chief producing states being Pennsylvania, Ohio and Alabama, with 3,653,022, 875,265 and 726,888 gross tons of output respectively for the year. Illinois comes fourth in production, with 405,261 tons. Pennsylvania made over 51% of the total production for 1893, Ohio over 12%, Alabama over 10% and Illinois nearly 6%. The approximate annual consumption of pig iron by the home market, including imported pig, has been 7,007,194 tons for 1893, as compared with 9,318,742 tons in 1892, 8,381,674 tons in 1891, 8,959,679 tons in 1890, and 7,768,666 tons in 1889.

At the close of 1893 there were in the United States 43 completed standard Bessemer steel works, with 95 converters, and one new plant with two converters was in course of erection in Ohio. No Clapp-Griffiths steel plants have been built since 1889, and the total number of present works of this type is four, with seven converters. Only three were in operation in 1893. Of the four Roberts-Bessemer plants in the country, with six converters, only one was in operation last year. Bessemer steel, including the products of the above plants, was made in 13 states in 1893, though Pennsylvania, Illinois and Ohio lead in this industry. In the last year Pennsylvania made 66% of the total Bessemer steel output, Illinois over 9% and Ohio over 10%. The production returns of open-hearth steel in the United States include steel made in the open-hearth by the basic process, and the output of 1893 was 737,890 gross tons, against 513,232 tons in 1890, the increase of output being continuous for the intervening years. In the year considered 63,613 tons of crucible steel were made, as compared with 84,709 tons in 1892. The report gives the figures for all kinds of iron and steel rails rolled in the United States for each year since 1848. It commences with 21,712 tons in 1849, rises to 183,070 tons in 1860, 553,571 tons in 1870, 1,305,212 tons in 1880, and 1,885,307 tons in 1890. The maximum output recorded is 2,139,640 tons in 1887.

The wire nail industry has made wonderful strides in the United States since the output of 600,000 kegs, of 100 lbs. each, in 1886. In 1889 the production had risen to 2,435,000 kegs, and in 1893 it was 5,041,945 kegs, the highest on record. In this industry Pennsylvania again leads, with Ohio a good second, the 1893 output for the two states being 2,177,495 and 1,556,160 kegs respectively. The total of cut nails, which was 6,493,591 kegs in 1888, had fallen to 3,048,933 kegs in 1893.

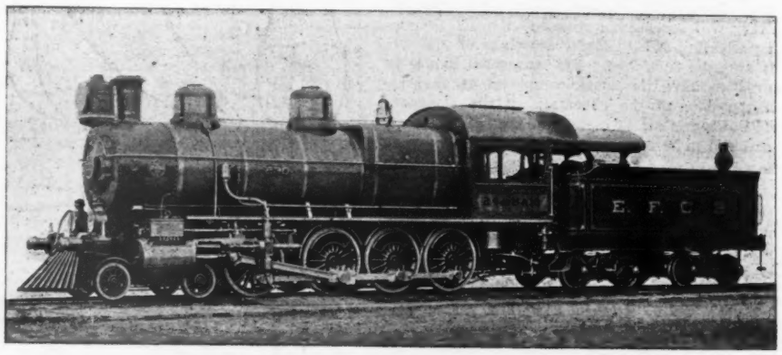
POWERFUL FREIGHT LOCOMOTIVES FOR BRAZIL.

We illustrate herewith one of the 15 heavy freight engines built by the Brooks Locomotive Works, Dunkirk, N. Y., for the Central Railway of Brazil (government owned line) and recently shipped from New York. We are indebted to the builders for the photographs from which our cut is made.

The engines are of the mastodon, or twelve-wheel, type, having eight driving wheels and a four-wheel leading truck. The Belpaire firebox is used, and is partly covered by the large and roomy cab, the roof of which is kept low on account of the tunnels. A roof is also placed over the tender footplate. The fuel is bituminous coal. As the railway is on the standard Brazilian gage of 5 ft. 3 ins., there is ample room for good arrangement of the mechanism and for a wide firebox. A screw-reversing gear is used. The general dimensions of the engines are as follows:

Driving wheels, diam.	4 ft. 6 ins.
Weight in working order, on drivers	138,600 lbs.
" " on truck	30,000 "
" " total	168,600 "
Weight of tender, loaded	82,000 "
" " empty	35,000 "
Cylinders	21 × 26 ins.
Boiler, diam. of barrel inside	5 ft. 8 "
" working pressure	180 lbs.
Firebox, Belpaire; size inside	9 ft. 6 ins. × 3 ft. 3 ins.

The engines all have names commemorating important events in Brazilian history. Each engine is erected complete at the works and tested. The rods and valve gear and trimmings are then taken down and packed in boxes, and the boilers, frames and wheels are separated for shipment. The engines will be re-erected at the government railway shops, located about ten miles from Rio Janeiro, under the supervision of an assistant from the Brooks Locomotive Works.

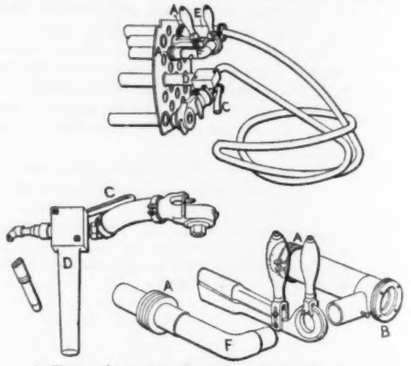


MASTODON FREIGHT LOCOMOTIVE FOR THE CENTRAL RAILWAY OF BRAZIL.
Brooks Locomotive Works, Dunkirk, N. Y. Builders.

TUBE-CLEANING DEVICE FOR LOCOMOTIVES.

At the August meeting of the Southern & Southwestern Railway Club a communication was read from Mr. C. F. Thomas, Master Mechanic of the Richmond & Danville Ry., in which he described an apparatus which he had designed for the rapid cleaning of locomotive tubes. The device is illustrated herewith. It makes use of compressed air from the brake reservoir to clean the flues. The cinders, when loosened, are driven back towards the inlet for the air pressure, and are then discharged into a collateral tube, extending into an open, or perhaps partly open, flue, through which they pass out to the opposite end of the boiler from the operator. Thus the device is not thrown back on the operator, as is invariably the case when blowing out tubes in the ordinary way, whenever the flue is stopped up and the air and cinders have no other outlet but the one they make for themselves at the mouth of the flue into which the air jet is introduced.

Its simplicity and small bulk allow it to be operated in front of brick arches, and thus avoid knocking out arches to clean flues. It works more rapidly than the flue auger and leaves the flue entirely clean. The double wedges of the holder clamp it fast in the flue and allow the cam motion to throw the double cylinders against the flue head, thus making an air-tight joint at A. The rubber diaphragm B prevents any air or dirt escaping around the flexible tubing and forces it through the adjacent flue to the other end of the boiler. The stop-cock C is placed at a convenient position by the plug holder D being pressed in another tube. The arrangement also permits the extension of cylinders E and F so that they will reach to the deck plate in cleaning about F, and take in the flues. It also has the advantage of allowing flues to be cleaned at any point on line of road where two engines stop at one time, so that the air of one engine can be used to clean the flues of the other without disturbing the arches.



A Tube Cleaning Device for Locomotives.

RATES OF PRECIPITATION IN RAIN STORMS AT ITHACA, N. Y.

By James H. Fuertes, Jun. Am. Soc. C. E.

The accompanying rainfall diagrams and the following discussion present some matter not in itself new, but which is worked up in a new manner so as to bring out certain important points.

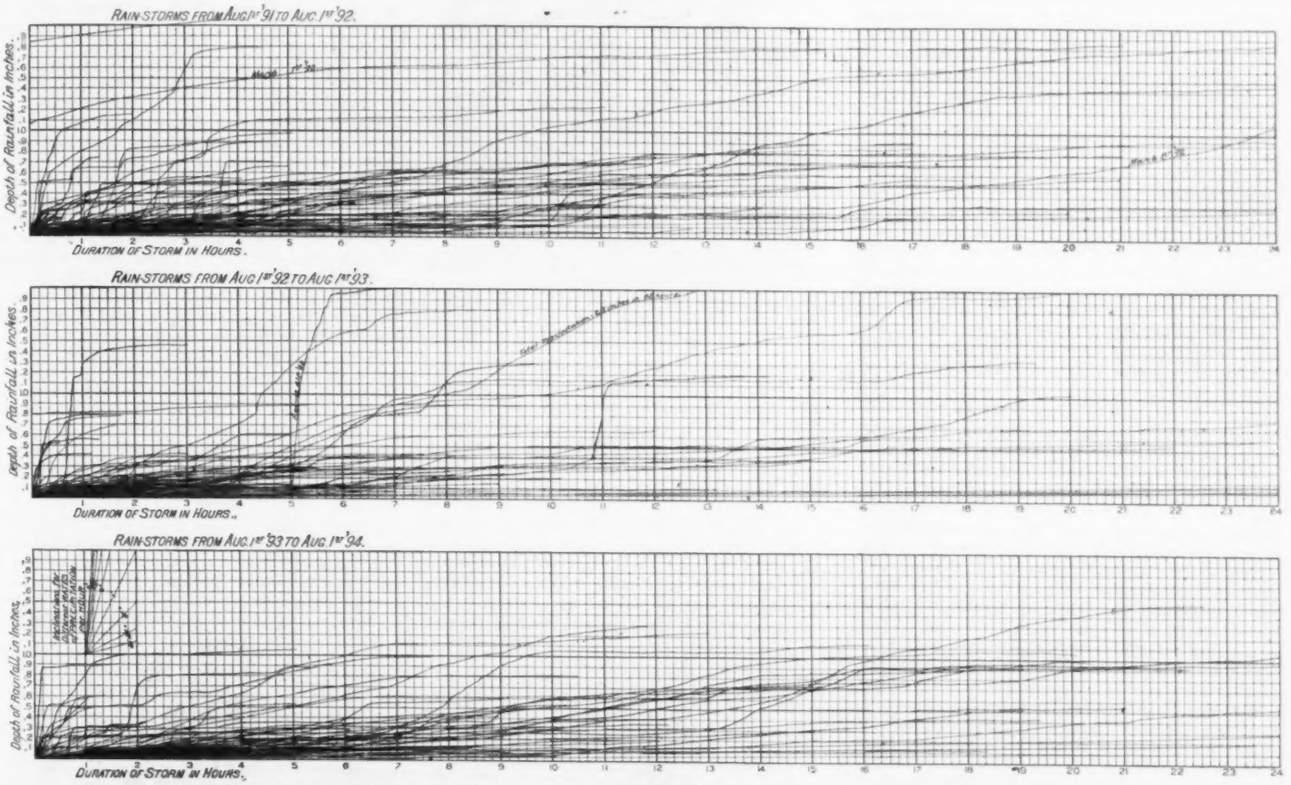
It has been long recognized by engineers that there are two classes of storms which principally govern the shapes and sizes of drains for carrying storm water. These are short storms of great rates of precipitation and long storms of ordinary rates of precipitation. It is concerning the latter class of storms that these diagrams give particularly valuable information.

Having recently had occasion to make some in-

vestigations in this matter and having access to the excellent rainfall record of the Weather Bureau of the College of Civil Engineering, Cornell University, through the courtesy of the director, I made a compilation of the records of one of the self-recording rain gages for the three years that it has been in service. These diagrams are produced by copying the record of each individual rain storm between the dates mentioned, starting each storm diagram at the same origin. Great care was taken in transferring the records, particularly in storms of high rates of precipitation, to make them as accurate as possible.

It will be seen at a glance that a large portion, from their use, we may also acquire more accurate data as to the extent of area covered by storms of various high rates of intensity in different parts of our country.

Upon an inspection of these diagrams it is at once evident that by far the greatest number of storms of rain that a drain would be called upon to discharge have a lesser intensity of rate than 0.05 in. per hour. It is also evident that if it is desired to give the drains self-cleansing velocities, their bottoms should be so designed as to give the greatest possible velocities to the quantity of water due to this small rate of precipitation, and that the shape of the balance of the section should be designed to suit conditions of economical construction, with a sufficient area of section, of course, to pass the greatest flood discharges.


RAIN-STORMS FROM AUG. 1ST '91 TO AUG. 1ST '92.
Depth of Rainfall in Inches.
DURATION OF STORM IN HOURS.
RAIN-STORMS FROM AUG. 1ST '92 TO AUG. 1ST '93.
Depth of Rainfall in Inches.
DURATION OF STORM IN HOURS.
RAIN-STORMS FROM AUG. 1ST '93 TO AUG. 1ST '94.
Depth of Rainfall in Inches.
DURATION OF STORM IN HOURS.

DIAGRAMS SHOWING RATES OF PRECIPITATION IN RAIN STORMS AT ITHACA, N. Y., DURING THE PAST THREE YEARS.

Compiled by James H. Fuertes, Jun. Am. Soc. C. E.

95%, or more, of the rain storms at Ithaca have a very moderate rate of precipitation, the greatest ordinary rate being about 0.05 in. per hour, and the most frequent or average ordinary rate about 0.025 in. per hour. The greatest observed rate of precipitation during this period is about 6 ins. per hour. Another interesting point is also brought out by these diagrams, which is that it is quite essential when estimating the quantity of surface water delivered from a given area, to consider the ground to be saturated at the time that the maximum rate of precipitation begins. It will be seen that there are several storms recorded where the rate of precipitation was very small for several hours, and then, after the ground was wet, there came a dash of great intensity. The storm of Aug. 4, 1892, is a very good illustration of this. During five hours it rained very slowly, the storm yielding in that period about 0.2 in., but then it began to rain very hard, and in the succeeding hour nearly 1.75 ins. of rain fell, the maximum rate of precipitation being about 5.5 ins. per hour, which was maintained for about 10 minutes.

These diagrams and their indications are, of course, only applicable to this locality, or to one similar as to climatic conditions. It is to be hoped that municipal authorities and others will make possible a more extended use of these automatic gages than is prevalent at the present time, so that, in addition to the many other advantages derived

It is interesting to note the difference in velocity of flow in a drain, for this small rate of rainfall, when a circular section large enough to pass the flood discharge is used, and when a section is especially designed to suit the conditions. Take as an example an area of 100 acres, urban in character, with an average slope of surface of 0.5 ft. per 100, a condition not unlikely to be met in practice. Under the conditions given we might reasonably expect the flood volume not to exceed about 180 cu. ft. per sec. On a grade of 0.5 ft. per 100 this quantity would require a circular drain 5 ft. in diameter for its delivery. The ordinary rain storms, with a rate of 0.05 in. per hour, would yield, however, only about 1.01 cu. ft. per sec., and the average ordinary storm of about half that rate only 0.5 cu. ft. per sec. An invert designed for the delivery of 1.01 cu. ft. per sec. on the grade given would be only 12 ins. in diameter and the velocity of flow 3 ft. per sec. The same invert would deliver 0.5 cu. ft. per sec. with a velocity of 2.5 ft. per sec. Referring now again to the circular drain 5 ft. in diameter, we find that when delivering only 1.01 cu. ft. per sec. the velocity of flow is but 1.8 ft. per sec., and when delivering 0.5 cu. ft. per sec. the velocity will be only about 1.26 ft. per sec. As a velocity of 2.5 ft. per sec. can barely be considered sufficient to keep the channels scoured free from deposits of sand and mud, it will be readily seen that it is quite necessary to properly proportion the inverts of drains for the removal of the storm water due to the most usual or frequent rate of precipitation.

TESTS OF RAPID-FIRE GUNS AND OF NAVAL GUN-SHIELDS.

The official report upon small-caliber naval gun tests, lately held at Indian Head, has been received by the Navy Department. These tests were for the competitive trial of one-pounder rapid-fire guns, and incidentally to test protective plates intended as shields for gunners. The gun trials have already been noted in this journal. Five plates were tested, three ½ in. thick, two ¼ in. thick, one of these was ½-in. thick tempered copper, treated by a secret process by E. G. Salter, of Detroit. The first four plates were submitted by the Chrome Steel Works, of Brooklyn, and the Midvale Steel Company. These plates were mounted on pivots at an inclination of 40°, as on board ship.

The ½-in. chrome steel plate, first tried, was 48 × 34 ins. and weighed 236 lbs. A Hotchkiss one-pounder was used against it, with an average muzzle velocity of 1,750 ft.-secs. for the three projectiles. The first shell penetrated the plate and broke up, with two 3-in. through cracks developed; the second also penetrated and broke up, showing a 6-in. through crack and a face crack; the third shot broke off a piece of the plate and developed a through crack to the bottom and a face crack to the top.

The dimensions of the ½-in. Midvale ordinary steel plate, which was next tested, were 34 × 48 ins. It weighed 233 lbs., and was subjected to three shots from a one-pounder, armor-piercing projectile, fired from a Hotchkiss rapid-fire gun. In the first round the striking velocity was 1,266 ft. per second. The shell struck the plate toward the bottom and to the left of the center line. It broke up, after having "gouged" the target to a depth of ¾ in. The second projectile had a striking velocity of 1,490 ft.

per second. It penetrated the plate, and developed two cracks, 1 in. and 2 ins. long respectively, on the left side. The shot hole was 3 ins. long and 1½ ins. wide, and showed a gouge on its under side. The plate was dished about ⅝ in. around the point of impact. The back bulge was 1¼ ins. high. In the third round the striking velocity was reduced to 932 ft. per second. The shell struck the plate normally and rebounded about 100 ft., practically uninjured. Five radial cracks were developed in the plate, each about 1½ ins. long. The diameter of the shot hole was 1.4 in. and the back bulge was 1¾ ins. high.

The Salter copper plate was next tried, and owing to the fact that much was claimed for it and little known of its resisting qualities, the test was undertaken with unusual interest. The results were disappointing to the experts conducting the experiments. The mounting inclination of the plate and other conditions of the test were the same as in the previous trials of the ordinary and chrome steel plates. But two rounds were fired. In the first round the shell had a striking velocity of 1,256 ft. per second. It struck the middle line of the plate, about 22 ins. from the bottom, and went through without breaking up or suffering any particular damage. The shot hole was smooth, the fringe ⅝ in. high and the back bulge ⅞ in. In the second round the striking velocity was only 1,004 ft. per second. Again the shell struck the middle line of the plate and penetrated without being broken up or deformed. The plate was dished ⅝ in. at the point of impact. In neither round were cracks developed, but as the plate showed but slight resistance to penetration it failed to come up to the requirements.

The ¼-in. plates were not satisfactory. The one manufacfured by the Midvale company, which was of ordinary steel, was first tested. Three rounds were fired at it. In the first round the shell, having a reduced striking velocity of 792 ft. per second, penetrated the plate and broke off a small piece of metal near the shot hole. The second projectile had a velocity of only 572 ft. per second. It did not strike the plate fairly and glanced off uninjured, making a gouge about ⅝ in. deep. In the third round the velocity was 683 ft. per second. The shell struck the plate near the top, to the right of the center line, going through without being deformed. Through cracks were developed in the plate in this round.

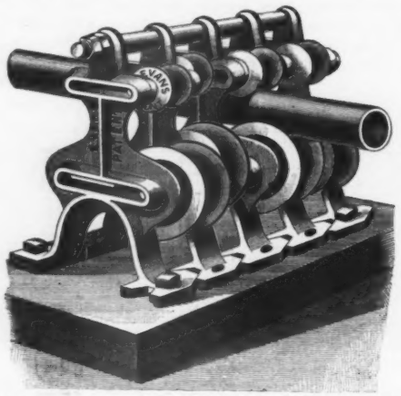
Two shots were fired at the Brooklyn company's ¼-in chrome plate. The first shell had a velocity of 683 ft. per second. It struck the middle line, near the top, and went through the target, breaking out a circular piece of metal by the impact. Two through cracks, each 2 ins. long, were made in the plate. The dish was ¼ in. The second shot failed to penetrate the plate and rebounded uninjured. A through crack from the point of impact to the right edge of the plate and another running 7 ins. below were developed. The dish was about ½ in.

The experiments with the .256-in. caliber small arm were highly satisfactory to the advocates of the reduced bore. Fired against the Midvale ¼-in. plate, two steel-jacketed 135-grain bullets, having behind them 34 grains rifilte, penetrated the target at a distance of 50 ft. At 150 yds. one bullet went through the Brooklyn company's ¼-in. plate. In firing at the ½-in. copper plate, at a distance of 100 yds., a bullet penetrated the plate. The extraordinary velocity of 2,550 ft. per second was developed in the firing.

In reply to directions from the Naval Bureau of Ordnance, Ensign Tisdale submits with his report interesting conclusions on the results of the several tests described. He says in part that the one-pounder rifle, firing a service shell at the velocity of 1,750 ft. per second may be counted on to penetrate ½ in. steel plates at ranges varying from 200 to 500 yds., even in case the plates are pitched at an angle of 40°, and that projectiles from the same gun, under similar conditions, will go through ¼-in. plates distant between 2,000 and 2,600 yds., and penetrate and break chrome steel plates as far off as 2,600 yds. In case the shot could strike the target normally, and not on an angle, Mr. Tisdale gives it as his opinion that, under the conditions mentioned, a ½-in. plate would be penetrated at a distance of 1,000 yds. Bullets from the new model small arm can, he says, go through an ordinary steel plate ¼ in. thick between 50 and 100 yds., a ¼-in. chrome steel plate between 150 and 200 yds. and a ½-in. copper plate at 100 yds. or over.

THE NATIONAL ANTI-FRICTION CARRIER FOR SWITCH RODS.

In providing carriers to support the rods or pipes which transfer the motion of the lever in the tower to the switch it is important to have as little friction as possible, so that the switch may be thrown easily and without undue strain upon the operator.



National Double Anti-Friction Carrier for Switch Rods.

The accompanying cut represents the National anti-friction carrier (Evans' patent), with double rollers having a travel back and forth as well as a rotary motion so that the friction is much less than that of rollers turning on fixed axes. Each standard is independent of the others, but the feet are so made as to dovetoil together, as shown in the cut. Where more than three carriers are used, the standards have a top lug for a through bolt, upon which are strung ferrules or distance pieces, so that with this connection and the dovetailing of the feet, the set forms practically one standard, and only the end standards require to be secured to the timber by lag or coach screws. In one place these carriers are used for 23 rods, side by side, and they are used on curves as well as on straight lines. This carrier is an English invention, and over 200,000 are now in use on a number of railways in England and France. The National Switch & Signal Co., of Easton, Pa., is introducing them in this country, and all its proposals for interlocking work contemplate the use of this device. The company has put them in at Syracuse on the New York Central R. R., and is now putting them in on the Lehigh Valley R. R., Long Island R. R., Lehigh & Hudson R. R. and Philadelphia & Reading R. R., and will use them also on the Metropolitan Elevated Railway of Chicago.

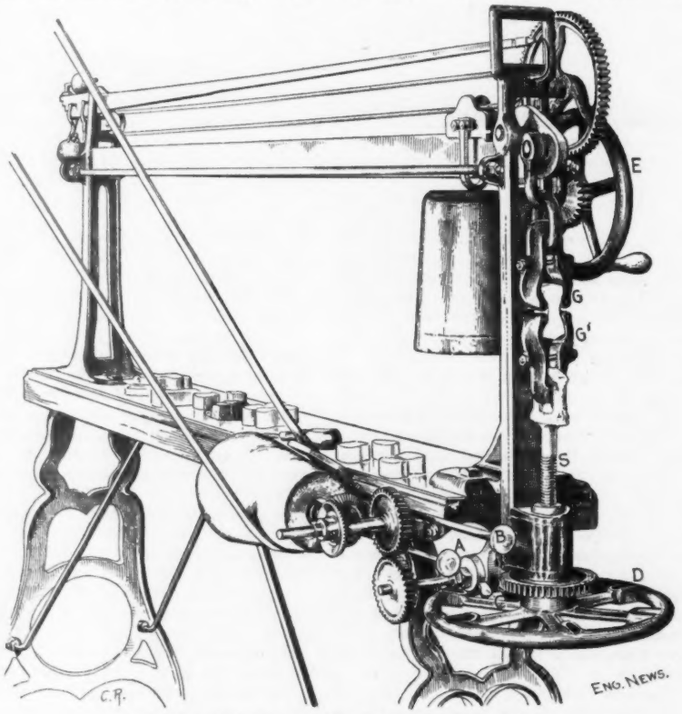
A POWER-DRIVEN CEMENT-TESTING MACHINE.

We illustrate herewith a Riehle cement-testing machine, used by Dr. Charles F. McKenna in the Department of Physical Tests of the laboratories of Dr. Gideon E. Moore, at 221 Pearl St., New York city. As shown in the cut, an attachment to the machine has been devised so that it is operated by the power from an overhead counter-shaft.

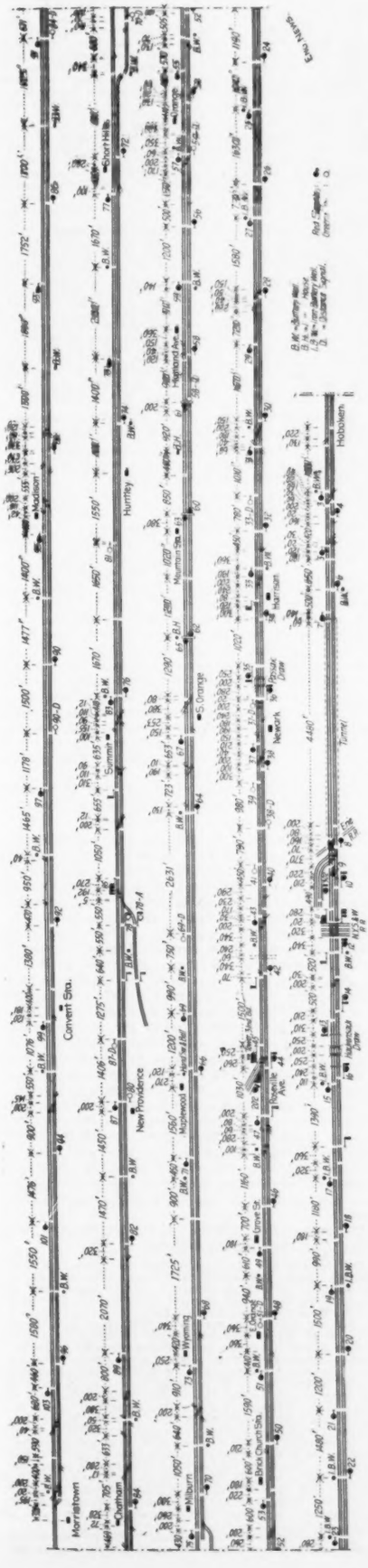
The machines in the laboratory are all operated by an electric motor of 5 HP., and a ceiling counter-shaft is driven by belt from the main shaft. On this counter-shaft is a cone pulley, having diameters of 4 ins. and 7 ins., with a length of 9 ins. The lower cone is mounted on an attachment firmly secured to the table of the machine and can be thrown in or out of connection with the gearing by means of a clutch operated by a rod, with the knob **A**. The belt can be shifted by the shifter rod with knob B. Also at C, the worm gear operating the hand wheel D, and screw S can be thrown in or out.

When in operation the speed of this wheel is perfectly uniform and can be regulated to give any rate of loading. If desired, the variation in the rate of loading can be effected during the progress of a test without any shock to the briquette. The movement of the counterpoise out upon the beam can be managed with the greatest nicety by turning the wheel E and keeping the needle very delicately in equilibrium.

Another neat device for facilitating accurate testing has been devised by Dr. McKenna and consists of a template which can be adjusted to the side of the briquette. This template has a vertical slit through its center line, and by this a pencil line can be drawn on the side of the briquette. Similar lines permanently marked upon the sides of the grips G and G', along the center line of the pull, enable the operator to make these lines all coincide, and thus insure the centering of the briquette.



A POWER DRIVEN CEMENT TESTING MACHINE.



Plan of Block Signal Plant and Semaphore Signals on the Delaware, Lackawanna & Western R. R., Beween Hoboken and Morristown and Montclair; The Hall Signal Co. and the Johnson Railroad Signal Co., Contractors.

THE HALL SIGNAL SYSTEM ON THE D., L. & W. R. R. AND D. & H. R. R.

The terrible rear collision which occurred near the Hackensack drawbridge on the Delaware, Lackawanna & Western R. R., Jan. 15, 1894, induced the officers of that road to consider the introduction of the block system, and after investigation of the different systems in use, it was decided to adopt the Hall automatic system, using signals which should stand normally at the danger or "track blocked" position.* Work was commenced without delay and the system was put in operation on July 10. On Sept. 12 the Hall Signal Co., of New York, gave an exhibition of the operation of the plant to a large number of invited guests, including the superintendents and signal engineers of several of the railways terminating in New York and Jersey City.

The Hall automatic block signals have been installed from the terminus at Hoboken to Morristown, 30 miles, and also on the Montclair branch, four miles, making 34 miles in all, of which 32 miles are double track. The length of block sections averages half a mile, but the sections are shorter in the neighborhood of the terminals. There are 126 signals (116 home and 10 distant), protecting about 150 switches, two drawbridges, four junction points and the Bergen tunnel. The traffic both ways is about 175 trains per day. Distant signals are eliminated, except in special cases, by overlaping the ends of the blocks. A train passing signal D sets it at danger as soon as the first pair of wheels has passed it, and at the same time clears the next signal in front, E, but does not clear the next signal behind, C, until the train has reached a point 1,500 ft. beyond signal D, so that it is protected by two rear signals within the limit of 1,500 ft. beyond each signal. At each switch is a miniature signal for the information of the switchman only. Suppose a switch on the block section D-E. A train passing C sets the switch signal at danger, and if the switchman then opens the switch, that sets D at danger, and D cannot be cleared until the switch is closed. If for any reason it is necessary to open the switch while the indicator is at danger, a flagman must be sent back, in accordance with standard railway practice. From Montclair to Bloomfield, two miles, there is only a single track, and the signals are interlocked so that a train cannot be started from each end of the section at the same time.

The track circuit is employed and the circuit wires (Simplex insulated wires) are carried in a wooden box or trunk laid between the tracks. The signal itself is a 15-in. red disk, enclosed in a case containing the mechanism, the case being mounted either on a post or on an overhead bridge, and having a 17-in. glazed opening. The arm carrying the disk has at its outer end a 7-in. disk of red glass, so that at night a red or white light is shown at an opening above the larger opening of the day signal. A number of improvements have been effected in the details of mechanism and in the relays, but no change in the general system has been introduced. In a few cases, on heavy grades, where it is difficult to start a train once stopped, and where also the speed is slow and the chances of collision are slight, green disks are used instead of red, so that an engineer may run under caution and yet not pass a red signal. On the accompanying plan "B. W." indicates the position of wooden battery wells, and "I. B. W." those of iron battery wells, the latter being used at places where the ground is too wet for the wooden wells.

At 13 places on the Morris & Essex Division and the Boston branch, the Johnson Railway Signal Co. has put in interlocking switch and signal plant at junctions, grade crossings and drawbridges, using manual signals of the semaphore type. As shown by the accompanying plan, the disk block signals are placed on the same posts as the semaphores, the latter being merely route signals, quite independent of the block signals.

The Hall Signal Co. has also recently completed a plant on the Delaware & Hudson R. R., extending from Albany to Saratoga, 40 miles of double track, or 80 miles in all. There are 80 signals, about one mile apart, operated on the normal danger system, but green instead of white is used for the clear signals at night (as on the Chicago & Northwestern and Boston & Albany railways). The overlapping of blocks is used, as already described, and there are but two distant signals. For heavy traffic on the Philadelphia & Reading R. R., on 10 miles of double track, between Philadelphia and Jenkintown, a double block system is used. There are two signals on each post, one green and one red. Thus, for block A-B the green governs A-A^1 and the red governs A^1-B. There are from 600 to 800 train movements per day, the trains running on one-minute headway during certain hours. This plant is not yet in regular operation, but a similar plant is in operation on the Lehigh Valley R. R. between Mauch Chunk and Penn Haven, 8½ miles. The Philadelphia & Reading plant we shall describe more fully in a later issue.

* The general principles of the Hall system, but with signals normally at safety instead of at danger, were described in our issues of Sept. 13 and 20, 1890.

PERSONALS.

Mr. W. B. Causey has been appointed Engineer of Maintenance of Way of the Atlantic & Danville R. R.

Mr. A. W. Gates has been appointed Superintendent of Sewers and Paving at Muscatine, Ia.

Mr. E. C. Rice has been appointed Chief Engineer of the Wabash R. R., vice Mr. W. S. Lincoln, resigned.

Mr. C. E. Schaff has been appointed Assistant General Manager of the Cleveland, Cincinnati, Chicago & St. Louis Ry.

Mr. Thomas A. Greene, President of the Milwaukee Cement Co., died Sept. 9. He was born at Providence, R. I., in 1827.

Mr. J. N. King, Superintendent of the Seneca Division of the Lehigh Valley R. R., has resigned to accept a position on the New York & New England R. R.

Mr. F. E. Dewey, Superintendent of Transportation of the New York & New England R. R., has been made General Superintendent, with headquarters at Boston, Mass.

Mr. William Ball and Mr. J. R. Allen have formed a partnership with the firm name of Ball & Allen, to carry on a general practice as consulting and mechanical and electrical engineers, with office at 1627 The Monadnock, Chicago, Ill.

Mr. Joseph M. Larimer, manager of the Chicago branch of Jones & Laughlin, died at Evanston, Ill., Aug. 24, at the age of 43. He was the inventor of the Larimer column for structural ironwork, illustrated in our issue of July 28, 1892.

Prof. Hermann von Helmholtz, the noted German scientist, died in Berlin Sept. 8, at the age of 74. He was a celebrated physicist, and since 1850 had made many investigations in electrodynamics. He was president of the Electrical Congress held at Chicago in 1893.

Mr. George A. Liernur, an American engineer in the Egyptian public works service, died at Carlsbad, Germany, Aug. 16. He was an engineer-director under the Ministry of Public Works, and was Resident Engineer on the reconstruction of the great Nile barrage, of which he was subsequently made director, under Sir Colin Scott-Moncrieff.

Mr. Kennerley Bryan, Assoc. M. Am. Soc. C. E., M. Am. Soc. M. E., has resigned his position as Engineer of Otis Bros. & Co., New York, and has become

associated with the Buffalo Engineering Co. He has also been retained by the Wilslow Bros. Elevator Co., of Chicago, as Consulting Engineer. His office is in the Erie County Bank Building, Buffalo, N. Y.

Mr. E. W. Creilin and Mr. W. D. Lovell have formed a partnership with the firm name of Creilin & Lovell, to carry on a general practice as civil and consulting engineers, with office in the Equitable Building, Des Moines, Ia. Their specialty will be the designing, superintendence and construction of iron and steel structures and the designing of water-works, sewerage systems, etc.

Maj. Thomas Turtle, Corps of Engineers, U. S. A., died in Washington on Sept. 18, from congestion of the liver. Maj. Turtle was born in Ireland and was appointed to the U. S. Military Academy from Massachusetts on July 1, 1863. He was graduated as a second lieutenant of engineers on June 17, 1867, and was stationed at Willets Point, New York, until 1869, when he was ordered to St. Paul, Minn. From 1870 to 1873 he was assistant engineer on the defences of Boston Harbor; he then reported to Colonel Craighill for work in West Virginia and North Carolina; in 1883 he was ordered to river and harbor duty in Florida and Louisiana, and in April, 1887, he was appointed assistant to the Chief of Engineers at Washington, holding that office until his death. He was made Captain of Engineers on Jan. 2, 1881, and Major in 1893.

Mr. John Humfrey Osborne, a civil engineer connected with some of the earlier railways of this country, died at "Summerside," Morrisville, Bucks county, Pa., on Aug. 30. From data furnished by his brother, Mr. Richard B. Osborne, C. E., the following sketch of his life is compiled: Mr. John Humfrey Osborne was born in Dublin, Sept. 30, 1818, and was a direct descendant of Sir Thomas Osborne, of Kent, England, Lord Mayor of London in the 16th century and afterwards the first Duke of Leeds. He was educated at Richard's Belhampton Academy, in Somersetshire, England; travelled as far as Australia before he was of age, and in 1839 came to the United States, and was first made confidential secretary to Mr. Wirt Robinson, Resident Engineer of the Philadelphia & Reading R. R. Co. From this position he rose through the several stages till he became Principal Assistant Engineer of the Philadelphia & Reading R. R. Co. in 1843, and in 1846 succeeded his brother, Mr. Richard B. Osborne, as Chief Engineer. He resigned this position in 1847 to join his brother on the Waterford & Limerick Ry. in Ireland, as Chief Assistant. In 1850 he was engaged on the Ogdensburg & Lake Champlain Ry., and in 1851 he was in charge of construction of a part of the Southside Railway, in Virginia, under Mr. Charles Sanford, Chief Engineer, who was acting for Mr. Moncure Robinson. In 1852-3 he was General Superintendent of Transportation of the Richmond & Danville R. R., and later joined the Camden & Atlantic R. R. Co., as Associate Chief Engineer. After the opening of this line he became General Superintendent and remained in that position until 1858. In the latter year, he took charge of the completion of 13 miles of the most difficult work on the Lebanon Valley Railway, completed it, and received the thanks of the President and Directors of the company. In the same years, 1857-8, he contracted for and rebuilt the Quakake R. R., 20 miles long, uniting the Black Creek Branch of the Lehigh Valley with the Catawissa R. R. In 1873-4, in connection with his brother, he conducted an extensive barometrical reconnaisance for the Shenandoah Valley & Ohio R. R., from Harrisburg, Va., over the Great North Mountains and the Alleghanies to the head of Greenbrier River. He possessed great executive ability; was a strict disciplinarian and commanded the respect and attachment of all associated with him. He leaves one son, Mr. Charles C. Osborne, of London, England, and a daughter, Mrs. R. H. G. Osborne, living in this country.

NEW PUBLICATIONS.

(Any book noticed in this column will be sent postpaid by Engineering News Publishing Co. on receipt of price.)

PHYSICS AND APPLIED ELECTRICITY, A Laboratory Manual of. Arranged and edited by Edward L. Nichols, Professor of Physics in Cornell University. (In two volumes.) Vol. II., Senior courses and outlines of advanced work. By George S. Moler, Frederick Bedell, Homer J. Hotchkiss, Chas. P. Matthews and the Editor. New York: Macmillan & Co. 8vo; cloth; pp. 444; illustrated; $3.25.

The first volume of this work on physics and applied electricity covered a general laboratory course for beginners. The second volume, here noted, supplements the first and is intended for advanced students prepared for special work. The first three parts, on applied electricity, alternating currents, heat and photometry, are especially arranged for the student of electrical engineering, while the fourth part treats of advanced work in general physics. In an appendix is given a logarithm table of light ratios for 1,000-part photometer bars. In the fourth part the influence of temperature upon physical constants and the properties of matter is taken up and elaborately discussed by Professor Nichols. This is followed by studies of the efficiency of artificial light sources; determination of the life curves of artificial light sources; spectrophotometry; the invisible spectrum; physiological optics, and the earth's magnetic field.

SOCIETY PROCEEDINGS.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—At the August meeting a communication from Mr. C. T. Thomas was read, describing a new tube cleaner for locomotive boilers. The committee on air-brake defect cards submitted a proposed form of card. Two other communications were read, one from Mr. E. M. Roberts, of the South Canadian & Georgia Ry., describing an extension front smokebox with perforated baffle plate; and the other from Mr. R. P. C. Sanderson, on the framing of the ends of box cars.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—At the meeting on Sept. 11, a paper was presented by Mr. B. W. DeCourcy, City Engineer and Chief Engineer of Harbor Improvements at Ocosta, Wash., on the improvement of Gray's Harbor, Wash. The work, which is being carried on by the Government, has been in progress for several years, and jetties and jetty dams have been built. The author held that had the engineers begun their work at the lower shoal instead of near the upper, better results would have been secured. He recommended easy curves instead of angles in the outlines of all jetties, to prevent the formation of eddies, and considered that half-tide jetties would in this case supply all the concentration of force required to give sufficient depth for vessels of the greatest draft.

ROADMASTERS' ASSOCIATION OF AMERICA.—The annual meeting was held in New York city, Sept. 11, 12 and 13. The first committee report and discussion were published in our last issue. The next report presented was on track joints. The following is an extract, containing the matter of chief importance and interest:

In looking over our reports, we find that at the Cleveland meeting, in September, 1887, the first report was submitted, which in substance recommended a heavy double angle bar, 28 ins. long, with supported joint, and four bolt holes. After a long discussion, the convention recommitted the report to the committee for future action, which meant that no recommendation was made. At the next meeting in Washington, in 1888, two reports were submitted, majority and minority. The former recommended the long angle bar, 42 to 44 ins., resting on three ties, with six bolt holes; the latter, the short angle bar, 28 to 30 ins., six bolt holes, suspended joint. After a protracted discussion on the two reports, the convention again decided that both reports be again recommitted to the committee they to report at the next meeting.

At the next meeting in Denver, in 1889, from the report of the committee, it is somewhat puzzling to discover just what they did recommend. The division of the members on the question of a suspended joint and a supported joint was still prominent. The only additional recommendation over the Washington meeting was that a supporting plate be used, to be of a length sufficient to cover the face of three ties; and this was considered worthy of trial. The convention finally adopted a substitute, recommending the long angle bar, resting on three ties. At the Detroit meeting, in 1890, the substance of the report was that the committee thought it only a matter of a short time until the fish plate and angle bar would become things of the past through some better device taking their place; and they addressed letters to different inventors, requesting them to submit samples to be turned over to the executive committee for trial. To this, the convention unanimously agreed. At the meeting in Minneapolis, in 1891, a lengthy report was submitted, accompanied by drawings, the substance of which report was that angle bars were dropped, and several truss joints were recommended as worthy of trial and notice; and the matter was again carried over to the next convention.

At the meeting held in Chattanooga and Atlanta, in 1892, Mr. Stearns, as chairman of the committee on track joints, presented the most thorough and complete report, accompanied by drawings, that had ever been made to the convention. This report again recommended various truss joints, in preference to the angle bar, naming the Truss, the improved Fisher and the McConway & Torley as having proved very successful from actual trial. They also indorse the Heath, Niles, Eno and Price joints as worthy to be investigated by a committee of the association. The Weber, the Cloud and the Thompson continuous joints were considered by the convention as being practically angle bars and were dropped from further consideration as new appliances, but considered as improved appliances.

At the convention held in Chicago, in 1893, Mr. R. G. Ward, as chairman of the committee, presented a very able and interesting report, taking up in detail the good and bad features of the following truss joints, which were submitted to the committee for trial: The Long truss joint, the Heath joint, the McConway & Torley joint, the Price joint, the Continuous joint, the Eno joint and the Niles joint. After a long and somewhat heated debate, the convention decided to recommit the report, and to continue the committee and request them to make further investigations, and report at the next meeting.

We have now given a synopsis of the reports since 1887. The cast chair in its day was good; the fish plate was considered better; the short angle bar superseded the fish plate; then came the long angle bar, with six bolt holes, which is still in use very generally, and is considered the best joint of the angle bar type yet invented. But many important roads are laying aside the long angle bars and replacing them with a truss or bridge joint. From a review of this subject, your committee can only offer to the convention the following:

Resolved, That, after a careful consideration of the subject of new track joints, we have concluded that the improvements and trials made in the last few years, with the various truss and bridge joints, convince us that they possess many advantages over the angle bar, for the reasons that the truss joints give an extra support from below and afford much more strength to resist the downward stress when the joint is under load; they tend to hold the ends of the rails on the same constant level, and give the best application of strength; while, on the other hand, the angle bar gives its greatest support under the head of the rail, where the bearing surface is very small, and practically no support to the base.

We consider the most successful new joints to be those that give the best support to the base of the rail, either as a bridge or truss, in addition to that given under the head; and those with as few parts as possible; the mechanical construction, with reference to fitting the rail section, being of prime importance. The list of prominent joints seems to be about the same as those given at the last convention, which was as follows:

The Continuous joint, Heath joint, McConway & Torley joint, Eno joint, Niles joint, Price joint, Truss joint, C. S. Churchill joint and the F. A. Delano joint. As previously stated your committee think that the fewer the parts the better the device. In looking into this feature, we find that while all of the list enumerated possess points of merit, and are highly indorsed by many, we consider the Heath and Thompson continuous joints come nearer filling the requirements as outlined in our recommendation than any other truss or bridge joints that we have knowledge of, for the reasons that they combine the principle of the angle bar and truss joint, serve to support both the head and base of the rail and have less parts than any other truss or bridge joint. J. W. Meade, Chairman.

The discussion on this report showed the hopelessness of arriving at any definite conclusions at present, for while several forms of patented joints have been found satisfactory, they are being constantly changed in detail and the experience with them is limited in point of time, and the ordinary good angle-bar joint, if well maintained, is an excellent joint. Besides the more or less extensive trials of special joints, the discussion included reference to every variety of angle-bar joint, with bars 28 to 48 ins. long, four to six bolts, and of the suspended, supported, bridge and three-tie systems. Still, there seemed to be a strong opinion in favor of a base support, and a resolution was adopted to the effect that the joint should be supported by a tie or by some form of truss, and that improvements in joints should be made in this direction. Several members thought that a definite conclusion should be arrived at, while others considered that there was not sufficient basis upon which to formulate such conclusions or recommendation, and eventually it was resolved to appoint a permanent committee on joints to carry out practical tests and to report progress annually. Most of the members considered the angle-bar joint a good one, especially in maintaining alinement, but, as already noted, it appeared to be a very general opinion that it should be reinforced by a base support.

Mr. Ward referred to the fact that improvements in certain joints had been made as the results of criticism made by former committees of the association. Mr. Black (Manhattan R. R.) stated that the Weber joint is being very extensively used, upon his recommendation. Mr. Lovell (Pennsylvania R. R.) said that one road using 42-in. six-bolt bars is replacing them with 26-in. four-bolt bars and replacing suspended by supported joints. Mr. Stickney (Boston & Maine R. R.) said he is using the continuous joint satisfactorily on old 72-lb. rails, greatly reducing the amount of surfacing. On new 75-lb. rails he is using the continuous and Weber joints. Mr. Morris (Lehigh Valley R. R.) said that when track is properly maintained and bolts are kept tight he finds little difference between 24-in. and 30-in. bars, or suspended and supported joints. A road master from the Atchison, Topeka & Santa Fe Ry. stated that that road is applying Heath joints to their road. Mr. Kerwin (Chicago & Northwestern Ry.) referred to the old use of outside wooden and inside iron bars (still used to some extent on the Boston & Maine R. R.—Ed.) Another member said that the McConway & Torley joint, if bolted up tight, is apt to crack the flange of the rail.

The next report taken up was that on standard track tools. The following is its substance:

On June 5 the committee met at Toledo, O., and gave a competitive trial to all the tools under consideration, including standard tools from over 20 roads. We found the greatest diversity in claw bars, as no two roads seemed to have the same pattern. In testing claw bars, every bar was given a thorough trial: first, with reference to its "nipping" power or power to catch a spike quickly and securely under the most adverse conditions that exist on track. The bar that distanced all competitors in this respect seemed to be a waif without pedigree and without a near relative in existence. It had for a long time been in use on the Chicago & Iowa Ry. (operated by the C., B. & Q.), and the foreman who was the happy possessor, being fully aware of its good qualities, guarded it so jealously that it had not been to the shop for several years, and it was only by a solemn obligation to return it "without letting any blacksmith spoil it," that its loan was obtained. On testing for a heel that would pull spikes without bending them, the Lake Shore & Michigan Southern Ry. standard was pronounced the best, and this feature, with the L. S. & M. S. chisel point at upper end, was adopted.

In tamping bars considerable variety was found. The pattern recommended for a standard is a modifi-

cation of the Union Pacific standard, and your committee believe it will prove a tool well adapted to general work in all kinds of ballast. In tamping picks we found little variety in design. It was the sense of the committee that it would be better to recommend a "puddle" for tamping gravel, cinder, sand and dirt ballast, and a combined "puddle and pick" for stone ballast. The puddle recommended is a modification of the Michigan Central standard and the puddle and pick is simply a combination of a puddle of the same pattern, with an ordinary railway clay pick.

The committee examined and tested a large number of shovels, such as are designed for railway work, but found no shovel embodying their conception of what should constitute a model for a standard. The weak points in welded as well as unwelded shovels seem to be in the tendency to break from the top of the blade downward, and lack of strength of the straps immediately above the blade. In addition to recommending a shovel made from one piece of crucible cast steel, No. 12 gage, properly tempered and the straps strengthened by a socket for the handle extending at least 1¾ ins. above the blade, we desire to call the attention of manufacturers to the necessity for re-enforcing, or in some manner giving additional strength to the upper part of the blade to counteract the tendency to break from the top downward. The committee desires to extend thanks to the Verona Tool Works and Hussey, Binns & Co., of Pittsburg, and to Hibbard, Spencer, Bartlett & Co., and Crevar, Adams & Co., of Chicago, for kind assistance given in collecting tools for the competitive tests. As the result of our work, we herewith submit for your approval and adoption as standards a claw bar, tamping bar, puddle and pick and puddle.

Gurdon W. Merrell, chairman; T. Hickey, J. A. Prentice, W. H. Mantz, J. Column.

The only criticism made was that the tamping bar was too small in diameter (⅞ in.) to be easily grasped, and reference was made to the use of a gas-pipe handle, which increases the diameter without increasing the weight, but a proposition to make the diameter 1 in. or 1¼ ins was voted down. All the four standard tools were adopted as recommended. These standard tools are illustrated in another column.

The next report presented was on inspection and distribution of track ties, and was as follows:

This work is necessarily governed by the conditions and circumstances of each individual case. Where the ties are furnished along the line of the railway, they should be delivered at a loading track, piled up in square piles, not nearer than 6 ft., and not more than 20 ft. from the rail. They should be piled with spaces between to admit of inspection, as well as air circulation around them. They should all be delivered before March 1, so they can be inspected, and the distribution begun before the spring work opens up. When they are received beyond the line of the purchasing road the inspector should be present when they are loaded into cars, and should check the number of each grade, in each carload, and report to the track department, giving car number and initials. They should be counted when unloaded to check the inspector's tally.

The inspector should be a man of honesty, tact and great moral courage, and his inspection should be fully sustained by the purchaser. When ties are purchased in large quantities the temptation to include poor ones is very great. Large sums of money are involved and great pressure is often brought to bear on the inspector to move him from insisting rigidly on the specifications. Several cases have come to the knowledge of your committee in which the inspector was removed through unfair means, evil reports, deceptions, etc., for endeavoring to follow strictly the specifications under which the ties were purchased.

It is generally the most satisfactory way to distribute them by work trains, under the instructions of the section foreman, supervisor or roadmaster, as to what points to unload and the proper number. In some cases they may be thrown from a moving train, about two ties per rail being the average required, but in many cases this is bad policy, either getting them off too thin or too thick, or rolling down high embankments. To unload about the proper number per mile at grade points, and complete the distribution by push car, is probably as economical a way as any, as it saves carrying ties around to get large ones for joints, and is also much the safest way.

If ties are received in small lots, or during a dull season, they may be distributed by local freight or extras, without much delay or expense for train service. The contract price usually includes the loading, but where it does not, they can be loaded for one cent each when delivered in large quantities.

We cannot omit to refer to the importance of having the ties cut in the fall and early winter for the following season's supply. Experiments show that timber cut when the sap is up is very much less durable than that cut when the sap is down.

Tests have developed the fact that a section of December cut wood will allow no water to pass through the pores. January cut wood will allow a few drops to pass through in 48 hours. February cut wood will pass two quarts in 48 hours, while March cut wood will pass two quarts in 2½ hours. Consequently the value of all ties, post and bridge timber can be improved in no way so cheaply as by being cut at the proper season.

Garrett Davis,
M. W. Cooley.

In the discussion Mr. R. G. Ward and other members explained further the economy resulting from the cutting of timber at the proper season, as its life is thereby considerably increased. Seasoning also is very important, and ties should not be used for at least six months after they are cut. Ties cut from small sticks and consequently with the heart wood near the center are better than split ties having one side sap wood and the other side heart wood. Mr. Ward pays 5 cts. per tie extra for the former kind. He also stated that in one case where the managers of a road were instituting rigid economies they required that one-twelfth of all the ties required should be cut each month in the year; the supposed economy resulted in seriously reducing the life of many of the ties. There was considerable discussion as to the proper time for cutting ties, and eventually it was decided that a committee should be appointed to report upon this matter, and also another committee to report upon increasing the life of ties by means of preservative processes and metal tie-plates. Mr. Robert Black (Manhattan R. R.) stated that his road recognized the advantages of tie-plates, and after having found flat plates 6 × 8 ins. were a failure, had used flanged plates since 1889, and is now laying them in large numbers. (Eng. News., Feb. 22, 1894.)

After some routine work and the adoption of resolutions of thanks to entertainers and others, the place of next meeting was voted upon, and the city of St. Louis, Mo., was chosen. The convention then adjourned until October, 1895. On Thursday there was an excursion by special train over the 36 miles of elevated railway, on Friday a steamboat excursion about the harbor, and on Saturday an excursion over the Lehigh Valley R. R. to Mauch Chunk, Pa.

Exhibits at the Convention.

American Nut Lock Co., St. Louis, Mo.—Spiral nut locks of twisted metal, the edges being intended to bite into the metal of nut and splice bar.

American Washer & Mfg. Co., Newark, N. J.—Spiral nut locks or washers of rectangular section, with the bearing faces either plain or cut into teeth.

Buda Foundry & Mfg. Co., Harvey, Ill.—Hand car fitted with the company's special steel wheels, shown in our issue of May 10.

Bush Cattle Guard Co., Kalamazoo, Mich.—Model of metal surface guard consisting of small inverted T-irons laid parallel with the rail and supported by cross pieces at the ends and middle.

Carlisle Mfg. Co., Carlisle, Pa.—Lithographs of specialties in frog and switch work.

Continuous Rail Joint Co., Newark, N. J.—The joint consists of a pair of angle bars with the flanges bent round to fit under the rail, the ends of the bars resting on the shoulder ties and forming a bridge support. This joint is in extensive use on the Boston & Maine R. R.

Diamond State Iron Co., Wilmington, Del.—The Churchill bridge joint for rails, as used on the Norfolk & Western R. R. 85-lb. rails (Eng. News., Dec. 8, 1892), and the Hill curved track spike, were exhibited by this company, which manufactures bolts, rivets, spikes, splice-bars, etc.

Dilworth & Porter, Pittsburg, Pa.—The well known Goldie sharpened spike, and the new form of Goldie tie-plate, having at each corner a lug with sharpened edge, the lugs cutting across the grain of the wood.

Geo. C. Dressel & Co., New York.—Switch and signal lamps of various sizes and designs.

Elliott Frog & Switch Co., East St. Louis, Ill.—Model of the Eureka spring rail frog, in which the spring rail is cut just beyond the spring so that the moving part is very short, the outside being strengthened by a short rail bolted against it. Also a model of a split switch with a single connecting rod between the switch rails, these rails being stiffened by reinforcing plates bolted or riveted to the web.

Eyeless Tool Co., New York, N. Y.—Steel picks of different kinds, with a socket riveted to the head, having jaws embracing the end of the handle, which is secured by a bolt through the jaws and handle.

Fairbanks, Morse & Co., Chicago, Ill.—The Barrett ratchet jack for track and bridge work. Also samples of the Sheffield steel wheel for hand cars and the Sheffield standpipe for filling tender tanks. (Eng. News, March 19, 1892.)

Wm. Goldie, Jr., & Co., Pittsburg, Pa.—Machine-made plugs for filling spike holes in ties. They are made from green elm timber, kiln dried and are sold at $1 per 1,000.

Hall Signal Co., New York, N. Y.—A model section of track equipped with the Hall signal system, and a full-sized disk signal in operation. An article describing this system is given in another column.

Iron City Tool Works, Pittsburg, Pa.—A large display of tools, crawbars, picks, spike mauls, sledges, etc., Also the Eureka nut lock, a square washer with one side cut and the metal bent from the plane surface.

McDonald Nut Lock Co., New York, N. Y.—The lock consists of a flat washer with a separate piece hinged at one end so as to spring against the side of the nut.

Merrill-Stevens Mfg. Co., Niles, Mich.—The Merrill cattle guard formed of parallel slats of T iron, and the new Cook cattle guard, formed of flat slats on edge with a wavy top surface, the high portions of one slat alternating with the low portions of the adjacent slats.

Thornton N. Motley & Co., New York City.—Specialties in track appliances, nut locks, etc.

National Lock Washer Co., Newark, N. J.—This lock is a spiral washer with a rib on the outer face which upsets the face of the nut and forces it into the thread of the bolt.

National Malleable Castings Co., Chicago, Ill.—Rail braces of box pattern with recess in bottom of back edge to fit end of crowbar in readjustment, etc. Also track wrenches, etc.

National Switch & Signal Co., Easton, Pa.—The National anti-friction roller carrier for switch rods (Evans' patent), illustrated in another column. Also the company's torpedo signal (Eng. News, May 22, 1891) and its electro-magnetic semaphore signal.

Niles Rail Joint Co., Chicago, Ill.—The joint consists of an angle iron with an inclined brace plate between top of web and top of rail flange. On the other side of the rail is an angle splice bar, with its flange bolted to the base of the angle iron. Four horizontal bolts hold the parts together.

Page Woven Wire Fence Co., Adrian, Mich.—A roll of the Page fence (made from coiled wires straight ened out), and photographs and blueprints of the fence.

Pennsylvania Steel Co., Steelton, Pa.—The Duggan switch with vertically moving rails (Eng. News., April 27, 1893). Also the Long and Acme automatic switch-stands, with rigid connections when thrown by hand, the latter remaining in whatever position it is set by the train or by hand. Also frogs and other track equipment.

Pettibone Mulliken & Co., Chicago, Ill.—The Jenne track jack with friction grip, and the Aikins forged steel rail braces of box pattern.

Q. & C. Co., Chicago, Ill.—Specimens of the different forms of tie plates made by the company and several ties of oak, cedar and chestnut from different roads, showing the effects of five to seven years' service of the plates. The Bryant rail saw (Eng. News, April 21, 1892) was also shown and operated.

Roberts Throp & Co., Three Rivers, Mich.—The Cyrus Roberts hand car, convertible into a push car, and having spoke wheels with spokes tapped into the felloe and the hub cast around them.

Ramapo Iron Works, Hillburn, N. Y.—Models of switches and frogs, and specimens of the Ross-Meehan tire-dressing brakeshoes.

Ruffner & Son, Philadelphia, Pa.—The Excelsior single and double nut locks for track bolts.

Selden & Riley, Baltimore, Md.—Automatic gong signal for highway crossings.

E. Saunders, Austin, Tex.—A metal cross tie of T section, with two cast iron rail seats riveted on, the rails secured by ordinary spikes driven into curved holes in the blocks. A truss rod connects the blocks.

Sheffield Velocipede Car Co., Three Rivers, Mich.—A full-sized hand car and specimens of the gearing used.

Smith Friction Drill & Tool Co., Boston, Mass.—A track drill operated by a roller friction clutch.

Stilwell-Bierce & Smith-Valle Co., Dayton, O.—The Stilwell ratchet jack for track work. It can be raised and lowered half a notch at a time and can be lowered instantly.

Verona Tool Works, Pittsburg, Pa.—The well known Verona nut lock, track gages and tools, and the Verona spike puller for use at guard rails, etc.

Weber Rail Joint Co., New York, N. Y.—The joint is of the bridge type, with an angle iron support, and wooden filler between splice bar and rail (See Eng. News, Dec. 20, 1890). It is used extensively on the Boston & Maine R. R.

Weir Frog Co., Cincinnati, O.—Model of split switch fitted with the new automatic switchstand shown in our issue of June 14.

Young Nut Lock Co., New York, N. Y.—The Brownley injector and the Young nut lock (Eng. News, May 10, 1894, and April 16, 1892).

COMING TECHNICAL MEETINGS.

ENGINEERS' CLUB OF CINCINNATI.
Sept. 20. Secy., J. F. Wilson, 24 W. 4th St.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.
Sept. 20. Secy, D. Carhart, Carnegie Library Building, Pittsburg.
NEW YORK RAILROAD CLUB.
Sept. 20. Secy., John A. Hill, Temple Court, N. Y. City.
ENGINEERS' CLUB OF INDIANAPOLIS.
Sept. 22. Secy., C. C. Brown.
AMERICAN PUBLIC HEALTH ASSOCIATION.
Sept. 25 to 28. Montreal, P. Q. Secy., Dr. Irving A. Watson, Concord, N. H.
DENVER SOCIETY OF CIVIL ENGINEERS.
Sept. 25. Secy., F. Ed. King, 36 Jacobson Block.
CENTRAL RAILWAY CLUB.
Sept. 26. Secy., S. W Spear, East Buffalo Iron Works, Buffalo, N. Y.
CIVIL ENGINEERS' SOCIETY OF ST. PAUL.
Oct. 1. Secy., C. L. Annan, City Engineer's Office.
AMERICAN INSTITUTE OF MINING ENGINEERS.
Oct. 2 to 6. Bridgeport, Conn. Secy., R. W. Raymond, New York.
WESTERN SOCIETY OF ENGINEERS.
Oct. 3. Secy., Thomas Appleton, Lakeside Bldg. Chicago.
AMERICAN SOCIETY OF CIVIL ENGINEERS.
Oct. 3. Secy., Francis Collingwood, 127 E. 23d St., N. Y.
ENGINEERS' CLUB OF ST. LOUIS.
Oct. 3. "Motions of Soaring Planes." Secy., W. H. Bryan, Turner Block.
TECHNICAL SOCIETY OF THE PACIFIC COAST.
Oct. 5. Secy., O. Von Geldern, 719 Market St., San Francisco.
ENGINEERS' CLUB OF PHILADELPHIA.
Oct. 6. Secy., L. F. Rondinella, 1122 Girard St.
WISCONSIN POLYTECHNIC SOCIETY.
Oct. 8. Secy., Geo. G. Mason, 144 8th St., Milwaukee.
ENGINEERS' CLUB OF KANSAS CITY.
Oct. 8. Secy., Waterman Stone, Baird Building.
NORTHWEST RAILWAY CLUB.
Oct. 9. Secy., W. D. Crosman, Ryan Hotel, St. Paul.
NORTHWESTERN SOCIETY OF ENGINEERS.
Oct. 9. Secy., D. W. McMorris, Burke Blk., Seattle, Wash.
CIVIL ENGINEERS' CLUB OF CLEVELAND.
Oct. 9, 11. Secy., F. C. Osborn, 721 Hickox Building.
NEW ENGLAND RAILROAD CLUB.
Oct. 10. Secy., F. M. Curtis, P. O. Box 1576, Boston, Mass.
ENGINEERS & ARCHITECTS' CLUB OF LOUISVILLE.
Oct. 11. Secy., G. W. Shaw, Norton Building.
CANADIAN SOCIETY OF CIVIL ENGINEERS.
Oct. 11. Secy., C. H. McLeod, 112 Mansfield St. Montreal.
ENGINEERING ASSOCIATION OF THE SOUTH.
Oct. 11. Hunter McDonald, Nashville, Tenn.
MONTANA SOCIETY OF CIVIL ENGINEERS.
Oct. 13. Secy., G. O. Foss, Helena, Mont.
NORTHWESTERN TRACK AND BRIDGE ASSOCIATION.
Dec. 14. Secy., D. W. Meeker, St. Paul, Minn.
ENGINEERS' CLUB OF MINNEAPOLIS.
Oct. 15. Secy., E. Nexsen, Kasota Block
ASSOC. SUPERINTENDENTS OF BRIDGES & BUILDING.
Oct. 16. Kansas City, Mo. Secy., S. F. Patterson, Concord, N. H.
WESTERN RAILWAY CLUB.
Oct. 16. Secy., C. F. Street, Rookery Building.
COLUMBIAN ENGINEERING SOCIETY.
Oct. 16. Secy., F. W. Hart, Washington, D. C.
AMERICAN STREET RAILWAY ASSOCIATION.
Oct. 17. Atlanta, Ga. Secy., Wm. J. Richardson, Brooklyn, N. Y.
ASSOCIATION OF ENGINEERS OF VIRGINIA.
Oct. 17. Secy., J. H. Pilcher, Roanoke, Va.
BOSTON SOCIETY OF CIVIL ENGINEERS.
Oct. 17. Secy., S. E. Tinkham, 36 Bromfield St.
AMER. SOCIETY OF RAILWAY SUPERINTENDENTS.
Oct. 20. New York. Secy., G. A. Hammond, Boston.
SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.
Nov. 15. Atlanta, Ga. Secy., F. A. Charplot, Macon, Ga.
SOCIETY NAVAL ARCHITECTS & MARINE ENGINEERS.
Nov. 15 and 16. Annual Convention in New York city. Secy., W. L. Capps, U. S. N., Washington, D. C.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.
Dec. 3 to 7. Secy., F. R. Hutton, 12 W. 31st St., New York.

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ADVERTISING RATES: 20 cents per line agate measure. Want notices, special rates, see page 22. Rates for standing advertisements sent on request. Changes of advertisements must be in hand on Monday afternoon; new advertisements, Tuesday afternoon; transient advertisements by Wednesday noon.

The summer of 1894 has witnessed a remarkable series of reductions in the transatlantic records, and the latest exploit of the "Lucania" in lowering the eastward record to 5 days 8 hrs. and 38 mins. indicates the probability of considerable further reduction in the west-bound record by her or her sister ship. Long experience has shown that the best records are, as a rule, made on the westward runs, and the feat of the "Lucania" in equalling her recent unparalleled west-bound record in a voyage in the contrary direction is a pretty good indication that she will yet succeed, under favoring conditions, in reducing her west-bound time by two or three hours more.

An interesting patent decision was recently handed down by Judge Acheson in the suit of the Edison Electric Light Co. against Westinghouse, Church, Kerr & Co. The suit was for infringement of a patent on a system of electrical distribution. Judge Acheson reversed the decision of the lower court and gave judgment for the defendant on the unusual ground that the improvement was not properly patentable. The gist of the decision was as follows:

> This patent does not deal with the complicated general problem of the distribution of electricity and the subdivision of the current for the purpose of domestic illumination. The patent is not for an incandescent lamp or for a dynamo for generating electricity or for the arrangement of the lamps in multiple-arc or for indicating and regulating devices for controlling the current from a central station, singly or combined. The patent deals with the one particular difficulty or drop in tension or fall of pressure—loss of electro-motive force—due to the resistance of the conductors to the electric flow. To remedy the evil effect therefrom the patentee provides special conductors for the transmission of electricity extending from the generator to the main conductors with which the lamps are connected and from which they are served. The patent is for a specific arrangement and proportioning of the two sets of conductors which together constitute the complete circuit.
>
> The plan of electric distribution covered by the claims in question is not "the creative work of that inventive faculty which it was the purpose of the Constitution and patent laws to encourage and reward." To sustain these claims would be to sanction a monopoly in that which belongs to the public. In announcing this conclusion, we cannot do better than quote some observations of the Supreme Court, which apply with great force to this case, as we read the proofs. In Atlantic Works vs. Brady, the Court said: "The process of development in manufactures creates a constant demand for new appliances, which the skill of ordinary head workmen and engineers is generally adequate to devise and which, indeed, are the natural and proper outgrowth of such development. Each step forward prepares the way for the next, and each is usually taken by spontaneous trials and attempts in a hundred different places. To grant a single party a monopoly of every slight advance made, except where the exercise of invention somewhat above the ordinary mechanical and engineering skill is distinctly shown, is unjust in principle and injurious in its consequences."

It is a well-established principle of patent law that mere changes in dimensions do not constitute a patentable improvement, nor can the monopoly of special dimensions be claimed by a patentee. The fact that this is true of dimensions and measurements in electrical work as elsewhere would seem to be established by this decision.

The National Irrigation Congress, which closed its session at Denver Sept. 8, was, as in previous years, devoted chiefly to the discussion of national and state legislative action concerning the irrigation problem, and instructed its executive committee to frame appropriate bills for presentation to Congress. This executive committee is also charged with the immediate investigation of the problem of interstate streams, and it is hoped that it may be able to devise some permanent and satisfactory basis for the division of streams on a just and equitable basis. Other questions to be settled are the appropriation of sufficient sums by the general government to carry on the work of securing water applicable to land reclamation; and for the survey of lands susceptible of irrigation, and the selection of reservoir sites. The congress further asked that some lands now reserved as reservoir sites by the general government be released and made available on application therefor by states and territories. The fact that Congress recently provided for the cession of 1,000,000 acres of land to each of the states containing the same, as noted fully in our issue of Sept. 13, had a very moderating effect upon the discussion on the cession of lands, which was so heated last year. A resolution was offered, however, to the effect that no one individual should be permitted to acquire title to more than 40 acres, against the 160 provided in the act, unless local conditions require the enlargement of this home unit by reason of the small value of crops produced. The convention finally referred all these resolutions back to the several state irrigation commissions, with instructions to endeavor to report to the next National Irrigation Congress a more definite and satisfactory plan for the co-operation of national and state authorities. Another recommedation of the convention was that the President of the United States should at once appoint an international commission, made up of representatives from the United States, Canada and Mexico, which should examine into and settle questions connected with the utilization for irrigation of rivers serving as boundary lines between these countries, and should decide upon the equitable division of such waters for irrigation purposes. The irrigation problem is an important one, and affects the whole country more than is generally supposed. To the people of the great West the questions referred to above are vital, and, if correctly answered, there is scarcely a branch of industry that will not be stimulated thereby. On the whole, it is probably well that the congress took another year to consider many of the problems before it, for its work is largely educational, and, to be sure, must be slow.

The report upon the average mortality in the tenement house district of New York, as made by Dr. Roger Tracy, Deputy Register of Vital Statistics to the New York Health Board, is somewhat startling and is contrary to the usually accepted opinion upon the mortality in crowded communities. Dr. Tracy takes as his basis the last yearly census of the sanitary police, and this deals only with the tenement population, or those living in houses occupied by three or more families, living independently of each other, or where there are more than two families on one floor, living and cooking independently. These statistics include all families occupying houses of this class, except those living in the very expensive apartment houses on Fifth and Madison avenues. On this basis, the tenement population of New York was found to be 1,332,773, including 1,152,414 persons of five years and upwards, and 180,359 children under five years of age. This proportion is said to bear almost the same ratio to the total estimated population of the city as in 1891, being 69.26% of a total of 2,924,300. The census shows that this tenement population lived in 39,138 houses, an average of almost 34 individuals per house. Working with these figures of population, Dr. Tracy discovers the surprising fact that the average mortality among the tenement population is apparently less than the average for the whole city. He modifies this statement, however, by saying that many people from tenement houses die in public institutions, and are thus not credited to their homes proper. In 1893 the total number of deaths in the tenement district was 30,315, giving a death ratio of 22.75 per thousand, as compared with a ratio of 23.52 per thousand for the whole city. In 1891 there were 29,123 deaths among the tenement-house population, or a ratio of 23.71 per thousand. If to the return for 1893 we add the deaths reported in institutions and all other places that could by any possibility be credited to the tenements, we have a total of 34,726, corresponding to a death ratio of 25.77. But even this is small, says Dr. Tracy, as compared with the rates of some other large and crowded cities. For example, recent reports credit London with a rate of 27; Dublin, 29.9; Calcutta, 28.1; Bombay, 40.9; St. Petersburg, 35.9, and New Orleans, 28.1. The two most crowded blocks in New York, according to the report, are the following: The one bounded by Canal, Hester, Eldridge and Forsyth streets, measuring 375 by 200 ft., without allowance for streets, contains a population of 2,628 persons. This is equivalent to a density of population of 1,526 per acre. The other block is bounded by Stanton, East Houston, Attorney and Ridge streets; measures 200 by 300 ft., or 60,000 sq. ft., and contains 2,443 people. This is equal to a density of 1,744 per acre. The "curious fact" is reported that the highest death rate is found in houses containing the fewest tenants, and the lowest rate belongs to houses containing 100 and more tenants, the former rate being 25.39 and the latter 17.50. The simple explanation is that the crowded houses contain the poorest class of tenants, and these are more likely to go to the hospitals when ill. The largest percentage of children under five years of age is also found in houses containing 100 or more tenants. In the Seventh Ward of the city this percentage is 21.55, and in the Fourth Ward more than one-fourth of the population is under five years of age.

Dr. Tracy attributes this low and "decreasing" death rate to the sanitary precautions taken by the New York Board of Health, and there is little doubt but that the work of that bureau is excellent. But we fear that the inference drawn is somewhat too hasty and has little real value. To class almost 70% of the total population of New York among the "tenement population," as this term is usually regarded in crowded cities, is somewhat misleading. In fact, the very great majority of these people are living in very modern houses, provided with all manner of modern sanitary conveniences; and these houses will compare very favorably with the average individual homes of people living in other cities. In the slum districts, where population is densely crowded, Dr. Tracy himself admits that his death rate statistics are imperfect and do not give a true ratio; and when he adds the deaths in public institutions, which should be considered and must be credited to the tenement population proper, he finds a ratio of 25.77, as compared with one of 23.52 for the whole city. In his comparison of death rates, he also refers to such cities as Calcutta, Bombay and St. Petersburg, cities whose mortality statistics can by no means be fairly compared with New York. If we take the death rates in other American cities, where the tenement population does not figure so largely as in New York, we find somewhat different results. For example, the 1893 returns for Brooklyn give an average yearly death rate of 20.58; Baltimore shows 20.54 for the same period; Chicago, on a population of 1,856,695, claimed a rate of 17.0; Philadelphia, on a population of 1,115,562, had an annual death rate of 24.48, and the last report of the Massachusetts State Board of Health gives the average death rate in 30 cities containing 61.30% of the total state population, in 1890, as 20.6, as compared with 17.6 for the rest of the state outside of these cities. In other words, while no one would wish to detract in the slightest degree from the useful services of the New York Board of

Health, we are not prepared to accept the statement of Dr. Tracy, that by the extraordinary precautions taken by this body "the average mortality in the tenement population is less than it is for the whole city." He says himself that the highest death rate in the city, about 33 per 1,000, is found in the Fourteenth and Fourth wards, in both of which Italians abound, and these are known to crowd together in true "tenement" style. He explains this in part by stating that as these men come from Southern Italy and Sicily they cannot stand the rigor of an American climate so well as others, but the fact of the high death rate remains.

STATE OWNERSHIP AND PROTECTION OF FORESTS.

The New York State Constitutional Convention has unanimously adopted an article amending the existing forestry laws of the state and constituting all forest lands, now owned or hereafter acquired, "wild forest lands" forever. The article forbids the sale, lease or exchange of these lands, and the sale, removal or destruction of the timber on them. From the debate attending the adoption of this forestry preservation amendment, it seemed to be the opinion of the convention that this article would even prevent the construction of a railway through the reservation, whatever the necessity; would stop the building of all dams in this region, and would prevent the lease of tracts of land in the reservation, for any purpose, to public or private corporations. It was contended that the land included, some 3,000,000 acres, is good for nothing except for forests. It is high and barren, but the preservation of the timber upon it is necessary to preserve navigation in the Hudson River and to afford a source of natural water supply for cities in the Hudson valley.

This state ownership of forest land, now fairly inaugurated in New York by the acquisition of about 3,000,000 acres of lands of this description, is a comparatively new departure, for the permanent holding of land, either by states or by the national government, for other than building purposes or sale to the public, was but a short time ago deemed inconsistent with the institutions of this country. The State of New York was the first to make an exception in its Adirondack and Catskill purchases. It acquired the title to large tracts of land in these mountains, first through the failure of their owners to pay the taxes upon them and later through the definite adoption of the policy of protecting from destruction by fire and theft by lumbermen the forests around the headwaters of the state's principal rivers. It has come to be realized that the Adirondack forests are needed to preserve the flow of the chief tributaries to the Hudson and the towns and cities in its valleys, and the attempt has now been made to amend, or entirely avert, both a threatened and an existing evil by absolute state ownership of the region affected.

The general government has also, within the last three years, changed its former policy and has enacted a law permitting the reservation of forest areas for permanent government ownership, and it has now set aside about 13,000,000 acres for this purpose, out of a possible area of 73,000,000 acres of public lands which may be classed as timbered. The preservation of these forests from robbery and complete destruction, and the need of these wooded areas for climatic reasons, are again the chief incentives for this radical change in government policy.

Private ownership of woodlands has been divided into three classes by the U. S. Forestry Division, with regard to the preservation of the forests upon them. The first class includes the wood lots connected with farms, whose owners depend upon them for fencing material and fuel. This class constitutes from 35 to 40% of all the privately-owned woodlands, and their management need give us little concern, for self-interest is involved in their preservation and, to some extent, in their cultivation. The second class comprises lands owned by speculators, who simply hold forest property for the purpose of realizing from it the "unearned increment," and the third class is made up of lumbermen and manufacturers, who harvest and utilize forest products. The speculator is harmless, and, in one sense, does good, for he often holds his property intact for years, in the hope that markets may improve and means of transport for his timber be developed. The lumberman is the man chiefly responsible for the rapid reduction of our useful timbered area. At present he has but one purpose in view, and that is to convert into a merchantable commodity, as quickly as possible, all the valuable timber within reach of a market. The land has usually little value to him, or to any one else, except for the timber upon it, and he has not yet been taught that there is any possible profit in the scientific preservation and cultivation of his lands, regarded as a permanent investment. If he is engaged in the logging business, purchasing from others stumpage only, he is reckless and wasteful to a degree; his one aim being to convert his timber capital into dollars, regardless of the results of his methods of exploitation.

These are the various classes of private ownership, and the extent to which the timber capital of this country is affected by them will be touched upon later. The other element of forest destruction, and a most potent one, is fire, originating either from natural causes or from the carelessness or malice of man. How much timber is absolutely destroyed and wasted each year by forest fires, can only be guessed at; but the conflagrations of this year in Minnesota, Michigan, New York, Pennsylvania, and in almost every timber state to some material extent, point towards the enormous aggregate of this loss. An annual average of 3,000,000,000 cu. ft. destroyed by fire is the approximate estimate of the U. S. Forestry Division. Fires set by lightning can not be guarded against in virgin forest lands, if dead and dry timber and inflammable material abounds. But the enactment of laws, and more particularly the provisions of ample and effective means for putting these laws into effect, can prevent much of the damage from fires started by the agency of man.

The failure to enforce existing forestry laws is now the weak point in our state protection of forests. The two states having probably the most complete and rigid forestry laws in this country are Pennsylvania and Maine; yet Forest Commissioner Rothrock, of Pennsylvania, says, in a late letter, that hundreds of acres are burned over each year in his state, simply to encourage the growth of wild berries, to afford pasturage for cattle, or merely in pure malicious mischief. He saw, within the last year, one continuous tract of over 400 sq. miles burned over. The reason is plain; the law is held in public contempt because the state has utterly failed to provide the machinery for the enforcement of its requirements, and offenders go unpunished. The laws of Maine, on the other hand, are said to be successfully administered, because well-organized machinery is provided. This Maine law, passed in 1891, is well worth study, and, with proper modifications, could be adapted to the special conditions in any state. It is founded upon the principle that property can only be protected when this protection is for the common interest, and all the members of a community are made financially liable for loss from any cause. It clearly defines responsibility for the execution of the law, and ultimately rests this responsibility upon one person; it affords every facility for the ready prosecution of offenders and expects no efficient service except from paid officials.

In the 1892 report of Mr. B. E. Fernow, Chief of the Division of Forestry, U. S. Department of Agriculture, will be found the draft of a bill embodying the principal features pointed out above. It commences by the appointment of a forest commissioner by the Governor of the state, who reports directly to the Governor. This commissioner is to organize, superintend and be responsible for the protection of forest property from fire; he must collect statistics, give bonds for the faithful performance of his duty, and may be fined for neglect of duty. The fire service is organized by constituting as fire wardens the selectmen of towns, and sheriffs, deputies, constables, supervisors, or similar town officers. A town is divided into five districts, and over each is placed one fire warden, with some one of the wardens appointed to take command in case of large conflagrations. This leader, and at least half of the wardens, must be property owners, if possible. Special fire patrols are to be employed in dangerous seasons, and in remote sections, or for the special protection of forest property special patrols may be appointed by the commissioner, with the burden of their payment divided equally between the state and the owner. Each fire must be at once reported to the commissioner on prepared blanks by the fire wardens, and for this report the town or county pays on the certificate of the commissioner. Fire wardens are paid $10 as a retainer, and also receive payment by the day for the time they are on duty, at the same rate as sheriffs or special officers. Unless excused, they must pay a fine of $10 for any neglect to serve when called on.

One of the most important features of the bill is the creation of a fire-indemnity fund. Each county pays into the state treasury $1 for each acre within its limits burned over during the year, the area being ascertained by the county surveyor. The special fund so constituted is devoted to the maintenance of the system and to the payment for damage to forest property by fires originating without neglect on the part of the owners. Railway corporations are required to keep their right of way free from inflammable matter, by burning, under proper care, at certain fixed dates, and must use efficient spark-arresters. The law declares that fires originating on the tracks shall be prima facie evidence of neglect on the part of the company and the engineer and fireman are liable to arrest. A fire originating through the neglect of a railway company or its agents renders both the company and its officers liable for damages.

Where communities are widely scattered and the forest areas are great, as is the case in parts of Michigan, Minnesota and Wisconsin, for example, this law needs modification, and we doubt if even special patrols, however thickly planted, could prevent a dry-season fire from spreading when once well started. But the principle of this law is doubtless the right one; that paid officials, personally responsible for damage and having a property interest in the prevention of fires, form the best safeguard.

The next best system is that adopted in Canada and in satisfactory use there for about 12 years. This consists in the appointment of fire patrols by the government upon the recommendation of property holders, who pay one-half the expenses of the service. Under the Pennsylvania system, a district fire warden is appointed, who has a sheriff's power in case of a fire to call out a posse, put out the fire and charge the cost to the county treasury. The weak point is that this officer seldom exercises power until after the fire has started, and this, in many cases, is too late. The fire-safety strip established along some of the Prussian railway lines and often suggested for use in the United States, would call for a 200-ft.-wide right of way, and this would be an expensive luxury to the railways in many states. But where land itself is cheap and it is to the interest of both railways and property owners to guard against fire, it should be possible to make some joint arrangement of this kind. In many cases it would doubtless pay the owner to protect himself in this way regardless of assistance from the railway company.

The necessity for intelligent legislative action looking towards the preservation of forests has only been realized in this country within a very few years. Of all the continents of the globe North America most abounds in primeval forests, or at least it did a half-century ago. Our ancestors found here a land covered with timber, unbroken from the Atlantic to the valley of the Mississippi, and the supply seemed so exhaustless that they were prodigal in its use and misuse. But within the last few years there has been an awakening. Careful statistics have been collected and calculations have been made which plainly show that we are now annually consuming, in one way and another, far more timber than the forest area left us can possibly supply by natural growth. In other words, we are using up our capital rapidly, and unless we make some change in our methods the exhaustion of our useful timber supply is only a matter of one or two centuries.

According to the statistics collected by the U. S. Forestry Division, the present forest area of the United States, exclusive of Alaska, is about 500,-

000,000 acres, and much of this is useless timber or timber in remote and almost inaccessible regions. The annual consumption of timber for all purposes in the United States is estimated at about 22,000,000,000 cu. ft., divided as follows: Converted into lumber, 4,000,000,000 cu. ft.; used in railway construction, 5,000,000,000 cu. ft., and about the same quantity is employed in fencing. The large balance, and, in fact, more than half the total consumption, is burned up each year as fuel. If we add to this the estimated annual destruction by forest fires, the aggregate amount of timber used or rendered useless each year reaches the enormous total of 25,000,000,000 cu. ft., and the statistics of the last 30 years show that this consumption has increased at the rate of 30% for each decade. What bearing this consumption has upon our available timber capital can only be properly understood when we figure out the probable annual natural growth of timber, and appreciate the fact that the most of the timber now cut represents a growth of 150 years, or perhaps nearer 200 years.

For these data we must refer to the more carefully kept records of European forest management and those of the state forests of Germany furnish the best material for estimates. Prussia has about 35,000,000 acres of well-arranged forest lands, of which 8,000,000 acres belong to the state. The average annual production of wood from this area is stated to be 21 cu. ft. per acre; but this includes branch wood, brush and roots, all marketable in Germany, but never saved in our larger forests. Careful estimates give an average, for the Prussian forests of 3 cu. ft. of wood applicable to useful arts for each acre per year, and in the more carefully managed state forests this average is set at 6 ft. Baden has 4,330,000 acres of forest land, and returns the highest average annual wood production per acre, or 55 cu. ft., and of this only 10 cu. ft. can be called lumber in the industrial sense, the rest is simply fuel. With our heavier and thicker primeval forests, Mr. Fernow, Chief of the U. S. Forestry Division, estimates that 14 cu. ft. per acre per year would be an extremely liberal allowance for the natural wood produced. If we apply this figure to the whole 500,000,000 acres of forests remaining to us, we would have an annual natural timber growth of only 7,000,000,000 cu. ft., as opposed to nearly four times that amount consumed and destroyed within the same period. With every allowance made for some errors in our statistics, it is very evident that we are cutting into our capital at a fearful rate, and unless we take some heed of the future, coming generations will vainly regret our extravagance. If further proof were needed of our present prodigal timber consumption, we have it, on competent authority, that in the one year of 1892 the states of Wisconsin, Michigan and Minnesota, three of our richest timber states, cut down nearly 15% of all the timber with which they are credited. And to this late wholesale removal to a market must now be added the millions of cubic feet wasted and destroyed in the late forest fires in that region.

It is true that the development of the use of steel, terra cotta and concrete as structural material in late years is making it unnecessary to use timber for building purposes to the same prodigal extent as did immediately preceding generations; and it is well for us in many ways that this necessity no longer exists. But the uses of timber, outside of mere buildings, are manifold, and the denudation of vast areas of land once thickly wooded has an undoubted effect upon climate and upon the natural water supply. There is plenty of evidence to show that a large part of the broad plains of the West, now classed as "arid," were once covered with forests, and this fact argues a much heavier rainfall than is now available. Forests keep the soil in a loose condition, suitable for the storage of rainfall; they check evaporation and permit the accumulated supply to slowly percolate through the soil, and thence by springs, rills and large streams, either into some water supply or into the great rivers and to the sea. Unprotected by foliage, this soil becomes dry and baked; rainfall runs off in torrents over the surface, washing away good soil in so doing and rapidly finds its way to that ultimate reservoir, the sea, and is wasted for all useful purposes. The chief office of forest-covered land is to provide storage of underground water, that it may be slowly given out through natural channels in the seasons when rain does not fall and water is most needed. And the removal of forests entirely in time is claimed to affect the amount of rainfall itself. It is well that the absence of forests encourages the formation and presence of strata of heated air close to the ground, which drive off, instead of attracting and discharging, the moisture-bearing vapor passing over the region affected. Be this as it may, it is now undisputed that forests are needed for the conservation of useful water supply, and this alone is a potent reason for their preservation.

As to the scientific cultivation of forest trees, regarded as permanent investments, yielding a safe and regular annual income in timber products, we can yet say but little for the United States. Such a business as the commercial cultivation of timber practically does not exist in this country; we have hardly any men trained in forestry management and competent to act as expert superintendents; and more than this, there is yet too much timber "in sight" and it seems too plentiful for the present generation to realize the necessity for any particular effort to be made for the benefit of a coming generation. But the start has been made in the United States in the creation of a forestry bureau in our Department of Agriculture, and the good work already performed by that bureau is a strong argument for its perpetuation and development. It has already largely extended our knowledge of the useful properties of American woods, and would have done more had it not been so limited in means by unappreciative legislation. It has performed a very good work in gathering the statistics which define our capital supply in acreage and probable quantity, and point out the prodigal and wasteful methods attending our annual consumption of timber. But, probably, all that we can now expect is state action to prevent further waste of timber from fire and from the careless methods of lumber-extraction where this industry prevails.

This state action is an imperative duty, and the time has passed for false effort, which ends with the printing of statutes. Forestry laws must now be developed as the conditions change and experience points out need for amendment; and they must, above all, be actually enforced. The state of New York has now acquired a very considerable area of forest lands; but our law-makers must go further and provide liberal machinery for taking care of these forests and compelling obedience to the requirements of the law. These forests, close to a dense population, which sends a small army of campers into them every summer, and surrounded by lumbermen greedy to secure the timber within them, will not take care of themselves. And a body of eleven foresters is an absurdly inadequate police force for 3,000,000 acres of wilderness. New York has led the way in acquiring control over a part of its forest lands, and now let it set a further example to other states by a wise administration and management of this state property.

Russia, says a Reuter despatch, has finally decided to extend the Trans-Caspian railway from Samarcand to Tashkend, 190 miles to the north, with a view of further developing Russian trade in Central Asia.

LETTERS TO THE EDITOR.

CEMENT FOR GAS MAINS AT BRISTOL, TENN.

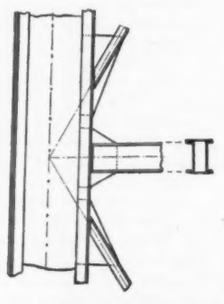
Sir: I note in your issue of Aug. 23 a reference to the use of Portland cement for making joints for gas mains. In 1891 I was engineer for the Bristol Gas, Electric Light & Power Co., of Bristol, Va., and Tenn., and I built the new plant. In laying the gas mains I used Dyckerhoff Portland cement to make the joints instead of lead. I made the paste of neat cement and just damp enough to be plastic. It was rammed in the joint with a calking tool. When the end of the bell was reached, the cement was beveled off, similar to the manner of making sewer pipe joints, and was worked in place very firmly with a very small trowel. Joints with special castings were made with lead. So far as I have been able to learn, the joints are just as good as though made with lead, and were certainly much more economical. In making the joint great care should be exercised to have the cement well worked in place.

Yours truly, R. C. Hollyday,
Civil Engineer U. S. N., Puget Sound Naval Station, Charleston, Wash., Sept. 1, 1894.

STIFF BRACING FOR VIADUCT TOWERS.

Sir: At the present time many engineers require the towers of viaducts to have so-called stiff bracing. To my mind it is very doubtful if the advantages claimed for such bracing are obtained in actual practice to any extent, except in a few special cases. In the first place, very little so-called stiff bracing has any stiffness worth considering. Single angles 3 × 3 ins., 4 × 4 ins., or 5 × 3½ ins. are used without question in lengths of 25 to 40 ft. or more. Often when they cross at the center one is cut and spliced by a flat. A round rod has as much compressive strength as such an arrangement. The claim that the angles with riveted connections cannot get out of adjustment is of less importance in my opinion than the fact that they are seldom or never in adjustment. Let us take an actual case: Fig. 1 shows a bent about 140 ft. high divided into five panels. We will assume that the work is carefully made and the lengths are correct. The holes will be punched 1-16 in. larger than the rivet it is intended to use, and when bolted in place with bolts the size of the rivets, there is 1-16 in. play, which is taken up by a sag in the member. The holes match within 1-16 in., and the rivets are driven, the sag still remaining in the diagonal. Suppose, again, that the angles are punched 1-16 in. too long. I doubt if any competent inspector would condemn them if they were so punched. In a long angle, with punched holes, if the length is right to 1-16 in., it is right for all practical purposes. We have then ⅛ in. too much length (1-16 in. play + 1-16 in. error). If the horizontal struts happen to be a trifle short, we have more; but the result is bad enough if we only assume that the diagonals are wrong by 1-16 in. An increased length of ⅛ in. in the diagonal corresponds to an increase of 7-32 in.—using the average of the five panels—in the length of one side of the triangle. The columns can then move over at the top of each panel 7-32 in.; or, as there are five panels, the top of the tower may move 1 3-32 in. There can be the same movement in the opposite direction, so the tower may wobble around 2 3-16 ins. without protest as far as the bearing is concerned. Will there be more motion than this when rod diagonals are used? I doubt it. In one or more shops the length between end holes is made ⅛ in. less than the figured length. This allows the piece to be drawn tight by drifts. I do not think this is a general practice, however, and even if it is, a little twist in the column, or inaccurate work somewhere else may give a case like that assumed above, or worse. The assumption made is not absurd, and any one who cares to examine a few viaducts can satisfy himself if the conditions exist as

Fig. 1. Diagram Illustrating Effect of Inaccuracy of Length of Stiff Bracing for Viaduct Tower.



Figs. 2 & 3. Examples of Bad Design in Details of Connection.

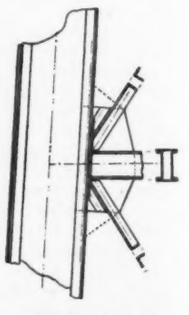


Fig. 4. Correct Method of Connecting Bracing to Columns.

stated. In my opinion stiff bracing is entirely out of place in a high tower. The columns will get out of line, and with no simple and quick means of bringing them back, they will stay out of line. How great a variation can be allowed and the original assumption remain in force? How long will the milled joints distribute the loads without eccentric strains? Theoretically, not very long. When stiff bracing is used it should be made stiff, and when that has been done, when the structure has been loaded with a mass of material for this purpose, what has been gained? In many cases, I believe, nothing at all. A riveted tension member is never an economical one. The general complaint that the bridge foreman is never happy except when he is swinging at the end of a wrench attached to an adjustable rod, is not so much an argument against the adjustable member as it is an argument for a better foreman, or new instructions. It is possible to make rods that will retain their lengths, and when in position it ought to be possible to have them left so. Suppose the masonry under a viaduct, with angle bracing, settles unevenly from any cause. The readjustment will be an expensive operation and the tendency will be to use some makeshift scheme to bring the loose parts into working order.

There is a common requirement that the diagonal bracing shall intersect on the axis of the column. As a result, details similar to those shown in Figs. 2 and 3 are seen. There is little art wasted on the everyday viaduct; but has the engineer any right to disregard appearance entirely and cover a structure with excrescences like these? Why not let the diagonals intersect at the inner edge of the column, and increase the section at this point as may be necessary? The bracing meeting at any point can then be neatly and compactly connected to a single plate, as in Fig. 4. Sometimes the engineer who rigidly insists on center intersections, makes no objection to the use of angles connected by one leg only, even in main parts. A 3 × 4-in. angle, connected by the 4-in. leg, and carrying 30,000 lbs., has a bending moment to resist of 22,500, approximately, giving a unit stress of 30,000 lbs. per sq. in. at the outer fiber. It does not seem consistent to utterly ignore the eccentric stress here and provide so carefully for it elsewhere.

Respectfully, Charles H. Wright.

Wilmington, Del., July 18, 1894.

RECENT IMPROVEMENTS IN CABLE TRACTION.*

By G. W. McNulty, M. Am. Soc. C. E.

This paper will be limited to a description of those improvements which have been embodied in the Broadway cable road of New York city. It must be distinctly stated that originality is not claimed for these improvements. Many of them had already been used on other roads, but not so long that they could not properly be called "recent."

1. Improvements in Power Houses.—As the upper part of the Houston St. power house was to be rented for store and office business, it was important that no vibration from the machinery should be perceptible above the basement. Also as the driving plant had to be installed and started before the building was completed above the first floor, and was everywhere pierced by columns supporting the upper floors, there was danger that with the imposition of the additional load of eight more stories, the compression of the soil might disturb the machinery foundations and throw the shaft bearings out of line. Fortunately, the remedy for both evils was the same, namely, to isolate the column foundations, which were composed of I-beam grillages resting on concrete. This was accomplished by surrounding each foundation by a steel cylinder driven to its full depth, 6 ft., into the sand. The machinery foundations rested entirely on the sand outside of the cylinder, and where necessary the column foundations were bridged over by I beams. The cylinder made a sort of slip joint between the sand inside and out, so that they could settle independently of each other. The result was very satisfactory. There has been no trouble from vibration or disturbance of the alinement of the shaft bearing.

At the Houston St. station the coal was dumped into vaults under the rear sidewalk wall, which were high enough above the boiler room floor to permit the coal to run out into wheelbarrows, from which it was shoveled into the furnaces, the only handling it received in ordinary circumstances. Hoppers under each furnace discharged the ashes into wheelbarrows, whence they were dumped into the foot of a link belt elevator, and raised to a bin from which they were discharged into carts in the rear driveway, all without handling. A reserve of several hundred tons of coal is kept in some lower vaults, from which it can be wheeled to the elevator above mentioned, and raised above the driveway and discharged by a chute into barrels on the boiler room floor.

An important part of the equipment of a power house is the system of hoists by which not only the repairs and renewals of the plant, but also its installation, are vastly facilitated. The time saved by such appliances is of special importance, where, as on the Broadway cable road, no stoppage of the machinery can be permitted. At the 51st St. power house, where there were no columns, it was easy, by means of trolleys running on fixed and traveling beams, to command every part of the room, and by the use separately or in combination of a five or a ten-ton hoist, to lift and transport any weight up to fifteen tons. This arrangement has practically nearly the convenience of a large traveling crane at very much less cost, and has the additional advantage that it can be used in two places at the same time, and cannot be disabled by a single breakdown.

At the Houston St. power house the multitude of columns, combined with the limited headroom, made any complete system of trolley hoists out of the question, but by placing a trolley girder over the line of the engine shaft, and one over each line of the cable driver shafts, and a pair of trolley girders over the jackshaft, it was possible to lift any portion of these shafts or their attachments, and carry it to the side of the room where it could be conveniently got at, or removed. By a combination of 4-ton hoists it is possible to lift 16 tons at the jackshaft and 8 tons at any of the other shafts. Separate trolley beams are provided for each engine to lift cylinder heads and pistons. In the 51st St. house a steam capstan and a pair of winch heads, running at different speeds, has been found very convenient in the rapid handling of heavy weights and in pulling and hauling around the floor. Unfortunately there was no good place for anything of the kind at Houston St.

2. Improvements in Power Plants.—On each boiler is an automatic valve, so called, through which the steam passes on its way to the main. In its ordinary operation it is simply a check valve in case of a rupture of any part of a boiler, to prevent all the rest of the battery from blowing through the injured one. There is nothing new about this, but the valve is so managed that by moving a small lever it will also automatically close against the pressure of the steam, and by having the levers of all the valves on a battery of boilers connected together by a single chain which may be led to any convenient place, it is possible in case a steam main bursts or a general smashup occurs in the engine room to safely and certainly shut off all the boilers in a very few seconds by a single pull of the chain.

Following the power through the engines, which present no novel features, we come to the transmitting gear connecting them to the cable drivers. Here rope drivers were adopted, not only to avoid noise and vibration incident to the use of gearing, which, as before stated, would have been very objectionable in a building used for business purposes, but to give a degree of flexibility in the relative motions of the cable drivers that could not otherwise have been obtained. This latter object was obtained by transmitting power to each shaft of the cable drivers by a separate set of cotton ropes whose elasticity permitted instantaneous slight changes in the relative speed of the drivers to accommodate sudden changes in the stress on the cable due to the variations in load, and also allowed a slight and continuous difference in that relative speed if required to compensate for the shrinkage or creep of the cable due to reduced tension as it leaves the drivers. A continuous variation, however slight, in the relative speed of drivers without slip of the cotton ropes does not at first sight seem possible without corresponding variation in the ratio of the diameters; but a little study of the conditions which are obtained while transmitting power by an elastic medium will show that such variations of speed cannot be avoided if the resistance varies. In this case such variations accomplish measurably the purpose of loose differential rings in avoiding undue stress on the cables while passing over the drivers, and the unequal wear of the grooves resulting therefrom. An experience of over a year shows that the grooves wear very uniformly.

Another feature of the plant that has been carefully studied has been the interchangeability, so to speak, of its different parts. By this is not meant the ability to move and replace, but to make a variety of different combinations, so that the plant can never be totally disabled by a single accident. For instance, in the Houston St. plant, there are four engines and four cable drivers, and any engine can be connected to any pair of drivers, making 16 possible combinations. All important pipes are also duplicated, so that really our only sole dependence may be said to be the smokestack.

The signal system is believed to be a marked improvement over anything that has been done before, and while a large part of it is necessarily connected with the street work, it may on the whole be best described here. Its operation is as follows: When an employee wishes to communicate with the power house, he goes to one of the signal boxes, which are located a few hundred feet apart and just outside the train rail; he lifts a small cast iron cover, opens the box inside and pulls a handle a certain number of times, corresponding to the signal he wishes to send in. In the engine room a large gong strikes the same number and a hand on a large dial points to the corresponding signal. When this has been done, the number of the box from which the signal has been sent in is struck on a small gong, and at the same time both numbers are printed on a tape for future reference. Besides the usual signals for starting or stopping the cable, etc., and sending assistance, provision is made for "plugging in" a portable telephone at any signal box. A separate signal system is provided for each of the three cable divisions.

3. Improvements in Cables.—There is nothing novel about the cables, except their size—1½ ins. diameter—which is believed to be larger than any previously used on street railways. Those on the lower sections are about four miles long, and at a speed of six miles an hour and 40 seconds headway, may sometimes be hauling as many as 60 cars at once. Doubtless a 1¼-in. rope would have been strong enough, as well as cheaper and lighter, but it would have stretched nearly 50% more under varying loads, giving a more irregular motion to the cars, and increasing the travel of the tension weights and the wear on the cable drivers. Its durability would for this reason have perhaps been decreased, and in an even greater ratio, and as frequent change of cable is a serious inconvenience, as well as expense, the larger cable will probably prove cheaper as well as better.

The large cables weigh nearly 40 tons each, a little over that, indeed, when mounted on the spools for shipment. They are delivered by a floating derrick to a special truck on which they are hauled to the power station by many pairs of horses. There a square cast iron shaft is put through the square hole in the spool and secured and centered by cast iron wedges drawn together by large bolts. The spool is then mounted in a wrought iron frame, the pillow block having spherical bearings, so that no cramping on the shaft can occur. The old rope is then cut, and the new one having been led over permanent sheaves to the tension run, is spliced on the other end of the old rope, brought up over the other permanent sheaves to a reel on which it is wound by a pair of engines geared to it, and having sufficient power to draw the old rope out and the new one in without assistance from the main engines. The shears, used to cut the old rope into convenient lengths for handling, can also be used for shearing and punching metal plates, often very convenient in repairing. With these arrangements an old rope can be drawn out and a new one substituted and started up and the cars shifted over to it in a very short time and without the gripmen being aware that any change has been made. The old rope can be cut up at leisure, being wound off by reversing the engines that wound it on.

4. Improvements in Vault Work.—Under this head is included all work below the street surface, except that immediately connected with the track. Perhaps the most important improvement here was the side-motion gypsy. In this device, the cable as it enters the conduit and just before it is engaged by the grip, goes over a vertical sheave, which carries the cable at the proper height to enter the grip. After the grip has passed the sheave it strikes a lever which forces the sheave horizontally into the conduit and lays the cable in the open jaws of the grip. When the grip leaves the lever the sheave is withdrawn by a spring. The arrangement is entirely automatic and has worked very well; it cannot, however, be used except where the cable enters the conduit.

Another gypsy, intended for use in all parts of the line, raised the cable from below the grip by a spiral wheel, which, while revolving, had the requisite lateral motion given by cams on its shaft. The motive power was supplied by cable, which entered a V groove in the spiral, and at the last of the revolution compressed a spring which, when released by the passage of the next grip, threw the spiral into part engagement with the cable. The device was ingenious, and for a time worked well, but as its operation depended entirely on the friction of the cable in the groove, it was soon found that when the rope became well lubricated and the groove a little worn its action was unreliable and its use was discontinued. This gypsy being actuated only by the Eve cable, could not under any circumstances throw it in the dead one, a point of much importance where two cables are run in the same conduit. Another gypsy has since been devised which can also be placed on any part of the line, which will automatically select the right cable, and is much simpler in construction, as well as more reliable in operation. As it has not yet been protected by patent, its operation will not be further described.

The problem of "floating" a hundred feet or so up a 1% grade, from the middle to the lower section of cables in front of the Houston St. power house, received much attention. Although it was believed that it could be successfully done, it was feared that where so many vehicles are passing frequent delays must occur from obstructions of various kinds; so to avoid the

*Slightly condensed from a paper read at the Syracuse meeting, Sept. 18, of the Street Railway Association of the State of New York.

trouble and expense of keeping men and horses on hand in case of any emergency, a so-called "lazy chain" was installed. This consisted of a heavy endless chain of the link-belt type running in a trough under the slot and just below the grips, which were to be engaged by protecting hooks attached to the chain and held up by springs to permit them to recede when the grips moved faster than the chain, and when the cars slowed down they would catch and propel it. To enable the gripman to stop after the lazy chain had caught, the chain was driven through a friction clutch adjusted to slip if the gripman put on the brake, and, as an additional precaution, and to prevent the friction clutch from being destroyed by a long stoppage of the car, a reducing valve was put on the steam pipe by which the pressure was kept too low to permit the engine to slip the clutch for more than one or two revolutions. As the engine was double, it would start again as soon as the brake was taken off the car, so that as far as the gripman was concerned its manipulation was much the same as if he had hold of the cable or was on a down grade.

Fortunately, further experience showed that with proper care the track could be kept clear, so that the cars would always float over without trouble, especially as in reaching this point they were gripped to a high speed cable, which gave the requisite velocity. A modification of this device, with the lazy chain working in a horizontal position, was intended to be used to operate a curved cut-off or short circuit at Bowling Green or State St. in case of accident or congestion at South Ferry, but that also has so far proved unnecessary.

As it was very difficult to lubricate by hand the bearings of the deflecting wheels in the vaults while in motion, a grease reservoir was clamped to some convenient point on the V frame and connected to the bearings by lead pipes, through which the grease was forced at intervals by screwing down on a piston in the reservoir, and the grease was directed by cocks to the upper or lower bearings as required.

5. Improvements in Track Work.*—The first and greatest improvement was in the rails, which were especially designed for this road. To simplify the yokes they were made of the same depth, and for convenience of paving, that depth was made 7 ins. In the slot rail, to secure a good support for the paving blocks, the web was made vertical with very satisfactory results. The head of the tram rail was made with a groove just large enough to take the wheel flanges and enable them to crowd out the dirt, but too small to permit a wagon tire to catch in it. The flange was 5 ins. wide, and contained enough metal to bring the vertical axis down to pretty near the center of depth, thus giving a very efficient girder section. The joint was made by a combination of a pair of four-hole splice plates, with a McConway & Torley clamp, the former taking the transverse and the latter the shearing stress and together making a very effective joint. Owing to lugs on the yokes and to the tie rods supporting the slot rail being half way between the yokes, the tram rail joints had to be one-quarter of a yoke space, or 13½ ins., away from the yoke center, being thus not exactly suspended or supported. The result was satisfactory. All slot rail joints were made on the yokes and no splice plates were used; only a larger and stronger washer being placed on the tie rod supporting the joint. This has answered fairly well. A drop forged, three-hole splice plate joint, originally designed for the Broadway slot rail, is being used on the uptown extensions with promise of very good results.

The substructure presents some very novel features. Stout cast iron yokes were used wherever practicable, primarily of three standard types, namely, for straight track, surface crossings and curves, the latter weighing nearly twice as much as the others. Some modifications of these had to be made in complicated structures, but the number of special cast yokes was kept as small as possible, special wrought iron yokes being freely used in all difficult constructions. In fact, throughout the entire work all details were standardized wherever practicable. In the surface crossings, for instance, a typical structure was designed for a square crossing, and crossings of any other style or combination of sizes on double tracks were made by a slight change in the details, for which no special drawing was required. Crossing yokes were made flush on top and kept low enough to permit the use of heavy sole plates under the rails. A number of holes cored in the top flange of the yoke permitted the secure attachment of the sole plates in almost any position. In this, as in other special constructions, the perpendicular web of the slot rail greatly facilitated all attachments thereto.

Cable crossings, which for sake of distinction were called intersections, were provided for at 23d St. and at Sixth Ave., but fortunately their use has not been required. With the possible exception of fenders, perhaps no other subject received so much attention from the noble army of inventors as did the cable crossings. We plan, however, where a cable has to be dropped, to simply "float" over, which our experience at Houston St. shows to be always easily practicable at the points mentioned. With an automatic release, to be described later, and an automatic gypsy, as before noted, the whole problem, both of construction and operation, at cable intersections becomes very simple. Crossovers from one track to another were always made with wrought iron yokes. They presented no other novel features.

Surface turnouts were made with tongue switches in place of runoffs, to secure better support for the wheels, and most of the latter tongues were secured by a locking pin that could be readily withdrawn from the surface, so that the tongue could be easily removed and replaced without disturbing the pavement. In cable turnouts, of course, the slot switch was the most difficult problem, but it was very satisfactorily solved by making the point of the tongue stationary and throwing the grip shank into the proper slot by movable pieces working under the head of the slot rail, or in special boxes and arranged to support the slot tongue when at rest. Of course the slot and track switches were connected so as to work together, and no case has yet occurred where the grip has taken the wrong slot. They have also stood up very well under the heavy traffic of lower Broadway, which, it may be remarked, is often more destructive to track work than the cable cars themselves.

Before coming to the curves the carriers should be mentioned, since, though possessing no very novel features, they have worked very satisfactorily. To save journal friction and especially to reduce the slip, which occurs when the cable first touches the carrier after having been lifted off by the grip, and which by its multitudinous repetition becomes a serious source of wear, they were made as light as possible. They were cast with solid arms and heavy chills. As with the duplex system each carrier had to be to one side of the center of the conduit, the size of the shaft bearings was made proportional to the weight they carried so as to secure uniformity of wear. Both bearings were contained in one bracket so as to insure proper position and alinement, and each bracket is secured from slipping by steady pins, resting on an angle iron frame at three points only so as to prevent chattering.

In curve construction, in order to get the wheels on separate shafts instead of on the same pin, it was necessary to stagger them, as they could not be far apart vertically. In this way either sheave could be removed while the other was running. Lubrication was effected through pipes, the soft grease being forced from the reservoir by a weighted plunger. An angle iron guide, bolted to the yokes in short lengths, took the side pressure of the grip, while the edge of a flat bar, extending in sections between the sheaves for the whole length of the curve guided each cable into its proper place. To get the cable started on the right side of this bar at the entrance of each curve, a so-called "flipper" was employed. This was a novel feature and deserves a moment's notice. It really was an extension of the flat bar or cable guide above mentioned, having a partial rotation on an axis parallel to the adjacent tangent. It was projected into the conduit between the cables, being kept out by a spring which permitted it to recede while the grip passed, but held it closely in contact therewith at a point between the cables so that the inner cable was kept above it and the outer one below, thus preventing the live cable from riding on the dead one, which would have done serious mischief. As a moving part kept in place by a spring and struck with some force by the passing grips many hundred times a day, it was adopted with some reluctance, but its action has proved very satisfactory.

6. Improvements in Cars.—While the grip is the fundamental feature of the car, and, therefore, comes logically under this head, it is also the heart of the cable road as far as its design is concerned, the nucleus around which all the rest of the structure aggregates and the ultimate factor of the whole work.

Unfortunately, in the Broadway road, through a peculiar combination of circumstances, which need not now be rehearsed, the grip was not fully designed until the road was nearly completed. However, by much patient study and some experimenting, it was found possible to devise a very satisfactory grip. As it had to be able to take a rope on either side and go either end first, the grip was necessarily quadri-symmetrical in plan, with, of course, a pair of jaws on each side, both pairs moving together. Contrary to the more common practice, the lower jaws remain stationary. This was done partly to reduce the depth of the conduit, which on Broadway was a most important consideration, but more especially to reduce the slip of the cable on the carriers as it trails from the grip. This, as before noted, is in the aggregate a serious source of wear to both cable and carrier, and its amount in each case is obviously in direct proportion to the length of time that the two are out of contact, which in turn is approximately proportioned to the height that the cable is lifted by the grip. The jaws are lined by steel dies rolled from rail billets, which have given very good results. The shanks were of structural steel, and have also done well. At the end of each cable section, and also in case of prolonged stops, it is necessary that the gripman should be able to drop the cable altogether. Suitable provision was made for this, but it was early foreseen that it was not safe to place entire dependence on the gripman's care, whose attention was liable to be distracted at the critical moment, and whose neglect was certain to wreck the grip if it did not strand or break the cable. An automatic trip was therefore added, actuated by inclined projections in the conduit, which ensure the release of the cable at all desired points.

Some of the grips first supplied did not have this device, and its value was abundantly demonstrated by the accidents which occurred through lack of it. As several devices have been proposed whereby the grip can be made to pick up the cable at any point, a feature at first sight of much value, it may be worth while to say, first, that where cars are run on such short headway as on the Broadway road, should it be lost, it will be but a fraction of a minute before the following car will be ready to push the temporarily disabled one to the next gypsy where the cable can be regained. Next, to permit the jaw to get under the cable at all points, would require either a deeper conduit than was practicable in view of the underground obstructions on Broadway or much more cleaning of the same. Last, but not least, all carriers would have to be carefully protected from damage by the grip, a matter of considerable expense and one which would seriously interfere with keeping the conduit clean. Concentric wheels were used for operating both grip and brake as requiring less room for their operation and permitting greater range of motion and consequently power, and a more delicate manipulation of the grip when "stealing" or running slower than the cable, as is so very often necessary on lower Broadway. They are for these reasons easier for the gripmen, and hence are preferred by them. While not quite so prompt as the lever, no trouble from that source has been experienced, and the starting and stopping of the car is less jerky.

The brakes offer no special features. Some air-brakes have been tried with satisfactory results, but the advantage has not been sufficiently marked to warrant their general adoption. The cars have been lighted with compressed gas on the Pintsch system, which has proved very satisfactory, and is believed to have been here used for the first time in street cars. The heating question has received very careful attention, and several tests of different systems have been made. Some method of hot water storage has promised the best results, but the difficulty of charging on such short headway would be very great, and the experience of one winter would seem to prove that with a road carrying so few long-trip passengers heated cars are not necessary.

7. Improvements in Car Barns, Etc.—An extensive and elaborate structure for the storage of cars has been very carefully designed, but has not yet been erected. Its dimensions will be about 200 × 600 ft. by 100 ft. high. Its most noticeable feature will be a combined transfer turntable now partly installed and designed to be operated by electricity, but at present moved by hand gearing. To handle cars in and out of the barn, it is proposed to use two or three small motors driven by storage batteries, compressed air or superheated water. To bring out a car, the motor goes after it and brings it out to the transfer turntable near the front of the building. This not only shifts it to the proper track to run out, but, rotating 100°, puts the motor in position to push the car out onto the line and come back for the next one without switching. Of course, in running cars in, the operations are exactly reversed and the turntable then prevents the motor from being shut in by the car it has handled. On the upper floors plain transfer tables traverse the center of the building, connecting with a car elevator at each side, while smaller motors or lazy ropes handle the cars on the floor tracks. Turntables would not be required here, as, if lazy ropes were not used, the motor belonging to the floor could always be placed near the transfer table opposite the track onto which the next car was to be run.

There is necessarily some complication of track work in front of the car barn, and all switches there are operated by one man in an elevated cab overlooking the whole street at that point, which has proved a very satisfactory arrangement. Suitable inspection pits and a well appointed machine shop equipped, not only for the repair, but also for the manufacture of grips when needed, complete the present installations at the car barn.

One difficulty, however, encountered in the construction of the Broadway road, can never exist to a like extent elsewhere. I allude to the underground obstructions, of subways, gas, water and steam pipes, pneumatic tubes, sewers and other matters too numerous to mention, which had accumulated in three centuries of the growth of a vast metropolis. Their removal alone would have been a formidable task, but as almost all

* See Eng. News, Aug. 22, 1891, for illustrations of track details on Broadway Cable Ry.

of them had to be kept in use while the removal was going on, and the street traffic had to be continued as well, the writer is inclined to look back on this part of the work with a feeling akin to astonishment at its successful accomplishment in so short a time. To construct and put in running order through such a labyrinth, a complicated machine five miles in length to be jointly operated by an army of engineers and gripmen with reasonable precision and freedom from derangement, is an achievement of which any corporation may well be proud.

Weeding railway tracks by electricity has been tried on the Illinois Central R. R., after lime, steam, fire and gasoline burners had been tried with little success. The apparatus, devised by Mr. J. Wallace, Chief Engineer, and Mr. A. A. Sharp, Division Superintendent at Memphis, Tenn., consisted of an ordinary flat car, to which was attached a sort of circular brush suspended at right angles to the track and of sufficient length to extend over the ends of the ties. It was studded thickly with fine copper wire, which came into contact with the weeds and grass on the track as the car passed over the road, the brush being so constructed that it could be raised or lowered at will. This brush was attached to an electric generator by fine wire, through which a strong current of electricity passed to the brush, and from it to the weeds through which it was driven. Its touch killed the weeds, root and branch. The machine, after thorough trial, is said to have been pronounced a success. Attached to the car is a box car carrying a stationary engine and dynamo.

An interesting piece of work, recently done on the Brooklyn Water-Works, was the connection of a 12 and 36-in. cast iron water main. The work was done with the aid of a tapping machine, which cut a 12-in. disk from the 36-in. main, and allowed the connection to be made without any lowering of pressure or interruption of the service. Had the old method of breaking out a section of pipe been employed, not only would the length of pipe have been spoiled, but it would have been necessary to close two 36-in. gates and 30 gates 6 and 8 ins. in diameter, stopping a supply of some 17,000,000 gallons of water for a number of hours, and affecting perhaps 200,000 people. (See Eng. News of Jan. 24, Aug. 15, 1891, and July 13, 1893, for description of pipe-tapping machines.) This 36-in. main was laid 35 years ago from pipe made in Scotland. The iron was close in texture and was coated, probably with Dr. Angus Smith's preparation. The coating was found to be but slightly impaired after 35 years of use, tubercular or other deposits on the interior being very slight. This is an excellent example of the value of a good preservative for cast iron pipe. The above information has been abstracted from a volunteer paper presented by title only at the recent meeting of the New England Water-works Association (Eng. News, Aug. 30, 1894). The paper was prepared by Mr. Peter Milne, Secretary of the association and Engineer in Charge of extension and distribution of water within the city of Brooklyn.

A report of the terrible explosion in the Albion colliery, South Wales, which occurred a few months ago, and by which nearly 300 lives were lost, has been made by Mr. Dixon, a member of the royal commission on explosions from coal dust in mines. He says that the facts of the explosion appear to be strikingly similar to those at Seaham, the flames having traversed nearly all the main roads on both sides of the shaft. Concerning the fuel by which the explosion was propagated through the mine, he was quite satisfied that sufficient dust was lying in a fine and dry state along the main roads to feed the flame throughout the parts penetrated by the explosion. The coal gives off gas; but no accumulations of gas had been observed. He did not see how it was possible for firedamp to have accumulated in the main intake air roads, or to have been introduced suddenly into them in sufficient quantity to feed an explosion throughout the extent of road actually traversed by the flame. There could, in his opinion, be no question that the explosion throughout its main extent was a pure dust explosion. One important point would no doubt be brought out at the official inquiry, viz., whether instructions were given to water the dust near the shots, and whether such instructions, if issued, were acted upon. He saw no evidence that water had been used to lay the dust at the first fall, and could not learn that watering had been adopted on this occasion. But he could not speak with any certainty on this matter. The evidence must be sifted. The company were aware of the dangerous nature of dust; he found the water pipes intended to damp the dust by spray already extending some distance along the intake.

An ordinance appropriating $1,000,000 for the purchase and improvement of land for park purposes has been introduced in the city council of Louisville. A popular vote must be taken before the bonds can be issued.

A new union station is being built at Jacksonville, Fla., about one-fourth mile from the old station, by the Jacksonville Terminal Co., of which Mr. H. M. Flagler, of New York, is President. The train shed is 1,080 ft. long, and its greatest width is 165 ft. There will be eight tracks under the train shed, which is a through station, and by the side of the arrival platform will be a station building fronting 300 ft. on the street. The structure will be completed in readiness for the winter traffic. The project also includes a union or joint freight yard, which will be thoroughly equipped with interlocking plant. The terminal will be used by the Florida Central & Peninsular Ry., the Savannah, Florida & Western Ry., the Jacksonville, St. Augustine & Indian River Ry., and the Jacksonville, Tampa & Key West Ry.

The American commission to resurvey and erect monuments on the boundary line between the United States and Mexico has completed its work, under Col. B. W. Barlow, Chief of the commission. It commenced this survey 2½ years ago, and in that time has surveyed 700 miles of line, from El Paso, on the Rio Grande, to the Pacific. When the former survey was made only 52 monuments were erected on this boundary. In the survey just completed, 38 of these were found; though one section of 100 miles was without any monuments, and one monument was found one mile south of the true line. In all, the commission erected, or rebuilt, 258 monuments. Some inaccuracies were found in the old survey, but few of any moment.

The Peary auxiliary party reached St. Johns, Newfoundland, on its way home on Sept. 15, and brings the first news of Lieutenant Peary's experiences in Greenland. From a letter written by him to the New York "Sun," we learn that he started out for Independence Bay from his headquarters on March 6, with 8 men, 90 dogs, and 12 sledges. His route lay over the inland ice, 650 miles to the Bay. Eight days later two of the men had to return, owing to illness and frost-bites, and up to March 20 the progress was very slow, as there was a furious headwind and the thermometer was 35° below zero. From March 20 to 22, inclusive, the party was imprisoned by a blinding storm, and at its end they found many of their dogs dead. The anemometer showed that during the storm the average wind velocity for 34 hours was 48 miles per hour, and the average temperature record was 50° below zero, with a minimum of 60°. They left their camp on this ice-cap, 5,000 ft. above the sea, on March 28, in a furious gale of wind, and with two more men sent back to headquarters. The four remaining men struggled on until April 10, having then made 125 miles, or only one-fourth of the whole distance. Lieutenant Peary now found that his dogs were dying daily and that the "piblockto," or Greenland dog disease, had broken out among those remaining. He then determined to retreat, after "caching" a good quantity of his supplies, ready for another attempt next spring. The best day's march to the north was 18 miles, and the southward march was slower yet; but they reached headquarters on April 20, and devoted themselves to work in that region. In May, Astrup went to Cape York, 150 miles south, and completed the survey of the northern coast of Melville's Bay, hitherto unexplored. Peary himself explored the Ross Iron Mountains, near Cape York, and found the famous meteorites. Supplies were also carried up to the ice-cap, ready for the next spring work. Lieutenant Peary remains to finish his work if possible, and will use Eskimos as a supporting party, but Mrs. Peary returned, together with a daughter, aged one year. The auxiliary party explored Ellesmere Land and the Carey Islands, in search of the lost Swedish explorers, Bjorling and Kalstenius, but found no trace of them. They found some relics, possibly belonging to them, and also the skeleton of a man on the Carey Islands, probably that of a sailor.

CONSTRUCTION NEWS.

RAILWAYS.

East of Chicago—Existing Roads

BALTIMORE & DRUM POINT.—Press reports from Prince Fredericktown, Md., states that a company, the Baltimore & Southern R. R. Co., has been formed by James W. Owens, Thompson M. King, of Anne Arundel county; Thos B. Turner, of Calvert county; Almos D. Neeld, of Washington, D. C., and Luther H. Gadd, of Caroline county, to complete this railway and to extend the line across the Patuxent River to St. Catharine's.

INDIANA, ILLINOIS & IOWA.—This company is building an extension from Knox, Ind., to South Bend, Ind., which will make the entire road 150 miles in length, from Streator, Ill., to South Bend., Ind., and will form a short outside connection between the eastern and western trunk lines entering Chicago. The distance from South Bend to Streator, Ill., by way of Chicago, is 180 miles, while by the new line it will be 150. It is proposed to transfer through mail to this road and thus save the three hours now occupied in the work at Chicago, besides the extra 30 miles of travel.

QUEBEC CENTRAL.—About 20 miles of track has been laid on the Lake Megantic extension of this road and the entire 58 miles is expected to be in operation next spring. The contractors, Hope & Lukes, are said to have 1,200 at work on the line.

Projects and Surveys.

BRIGANTINE, BEACH HAVEN & BARNEGAT TRANSPORTATION CO.—Incorporated in New Jersey to construct and operate a railway and ferry line between Brigantine and Barnegat, N. J.; capital stock, $100,000; incorporators, John C. Kaufer, Henry German, Wilkes Barre, Pa.; Morris J. Keck, Brigantine, N. J.

RUMFORD FALLS & RANGELY LAKES.—Bids are asked until Sept. 24 for constructing 18 miles of this railway, as stated in our advertising columns. R. R. Straton, Engr., Rumford Falls, Me. This company was chartered Sept. 3 to build a railway from the terminus of the Portland & Rumford Falls road at Rumford Falls, through Rumford, Mexico, Roxbury and Byron to Bence's Stream on Lake Mooselucmeguntic, 28 miles; capital stock, $60,000; Pres., Galen C. Moses, Bath, Me.; Treas., F. H. Twichell, Bath, Me.; Clk., W. H. Newell, Lewiston, Me.; other directors, W. W. Brown, C. A. Brown, H. J. Chisholm and E. B. Denuison, Portland, Me.; Waldo Pettingill, Rumford Falls, Me.; Edward Plummer, Lisbon, Me.

Southern—Existing Roads.

BIRMINGHAM, SHEFFIELD & TENNESSEE RIVER.—The survey for the extension of this railway from its southern terminus at Parrish to Birmingham, Ala., was completed Sept. 15. The distance is 42 miles shorter than all other routes heretofore surveyed. English bondholders of the company are now in Alabama, and, it is said, have practically agreed to the building of the extension in order to get an outlet for their road, which, when completed, will form the rail part of an important rail and water route for shipping Alabama coal and iron west, by way of the Tennessee, Ohio and Mississippi rivers.

Projects and Surveys.

CHESAPEAKE & WESTON.—Incorporated at Charleston, W. Va., Sept. 15, to build a railway from Hawthorn, W. Va., to the Virginia state line; capital stock, $20,000 per mile; incorporators, G. O. Chilton, Bilton McDonald, J. A. Thayer, J. B. White and C. M. Alderson, all of Charleston, W. Va.

HENDERSONVILLE & BREVARD.—This company will build at once 21 miles of standard gage railway from Hendersonville, N. C., on the line of the Ashville & Spartanburg road, to Brevard, N. C. Henry M. Warren & Co., 115 Broadway, New York, will have the placing of all contracts, including grading, rails, ties, rolling stock, etc.

KNOXVILLE & ANDERSON.—Press reports from Augusta, Ga., state that George Vanderbilt, who owns thousands of acres of land in North Carolina, is about to enter the field of railway building as a means of getting some of his timber to market, and will build a railway from Knoxville to Anderson, S. C., by way of Walthalla. A large part of the line is already graded, and should the road be completed it will decrease the distance between Cincinnati and the South Atlantic coast over 100 miles.

Southwest—Existing Roads.

CHESTER, STE. GENEVIEVE & FARMINGTON.—This railway was completed from Claryville, opposite Chester, Ill., by way of St. Mary's to Ferryville, Mo., this week. The line will probably be extended to Farmington in the near future, thus connecting the coal fields of Illinois with the lead and iron mines of Missouri. The graders and bridge builders on this road depart for Pemiscot county next week to begin work on another road Mr. Houck is now building from Caruthersville to Kennett, a distance of 25 miles.

CHICAGO, ROCK ISLAND & PACIFIC.—We have received information from Abilene, Tex., stating that H. A. Parker, Chicago, Ch. Engr., and Third Vice-Pres., arrived at Abilene last week having come over the route of a proposed extension from Henrietta, Tex., and reported a favorable route. Mr. Parker left in the direction of San Angelo, Tex. Right of way and station grounds have been obtained.

GULF & INTERSTATE.—Press reports state as follows as to the meetings of the directors and stockholders at Galveston, Tex., Sept. 7: The stockholders decided to amend the charter so as to allow the extension of the main line from the junction with the Southern Pacific northwest to the north line of the state of Texas at Red River, and to allow an extension northeast to the state line at the Sabine River. The capital stock was increased from $200,000 to $500,000 and application will be made at once to the Texas railroad commissioners for authority to issue a series of first mortgage 5% gold bonds to the amount of $10,000 per mile for the 250 miles of the road which will be built in Texas. At a meeting of the directors the contract heretofore made with the King-Charles Co. to lay its patent combination tie and rail on 150 miles of the line in Texas was amended in some particulars. The King-Charles Co. agrees to begin work within 60 days and complete the contract as early as practicable. The first road constructed will be the line between Bolivar Point and Beaumont, a distance estimated at 70 miles, of which about 40 are graded. Carpenter & Featherstone have been awarded the contract to grade the remaining 30 miles, and they agree to have the work done within the next 60 days. The King-Charles Co. agrees to take $1,500,000 of the bonds of the Gulf & Interstate Ry. Co., of Texas, guaranteed by the Gulf & Interstate Ry. Co. of Kansas; also $1,500,000 of the bonds of the Kansas company for 150 miles of road to be constructed north of the Texas line.

LITTLE ROCK, HOT SPRINGS & TEXAS.—The grading on this road has been completed from Benton west to Hot Springs, Ark., and about five miles of track have been laid from Benton west to the Saline River. Material for four bridges is on the ground and is being erected by the Union Bridge Co. Ten engines and 10 flat cars have already been received, and other rolling stock, including passenger coaches, will be delivered before Nov. 1. It is stated that the Illinois Steel Co. is delivering 1,500 tons of rails per month at Benton. As soon as the road has been completed to Hot Springs from Benton the construction is to be pushed westward toward Wister, Ind. T. The line has already been surveyed as far as Dallas, in Montgomery county, and right of way secured.

The company has made large purchases along the line to be utilized as town sites.

Projects and Surveys.

TRINITY, CAMERON & WESTERN.—This company has signed a contract, according to press reports, for building a railway from Georgetown, Tex., through Madison county, the construction to be commenced before Nov. 1. Major R. Lisle, Cameron, Tex., is interested.

Rocky Mt. and Pacific—Existing Roads.

CARSON & COLORADO.—A press report states that D. O. Mills, the chief owner of this railway, intends to extend the line to Mojave, Cal., probably within a year. This will give him two entrances into Los Angeles, one over the Southern Pacific and the other over the Atlantic & Pacific and Southern California railways. He has just had the survey completed, and but one thing is keeping him back. The gap is only 125 miles between Independence and Mojave, and the construction would provide an outlet for much of the low grade ores which do not pay a profit if shipped to San Francisco. Mr. Mills is only waiting to see how the English syndicate progresses with its 110-mile irrigation canal, and if it makes a showing that indicates good faith, he will rush the construction of his road. This canal begins 12 miles above Independence and is being built by the California Water-Works & Irrigation Co., of London, 18 miles being partly constructed. It will be 35 ft. wide at the bottom, and will carry 6 ft. of water.

SANTA FE, PRESCOTT & PHOENIX.—The grading on this railway has been completed for about 55 miles south of Prescott, Ariz., and 30 miles of the track laid. The contractors building the line are Lantry & Sons, Strong City, Kan. Ch. Engr. and Gen. Man., G. W. Vaughan, Prescott, Ariz.

Projects and Surveys.

OVERLAND PACIFIC.—The Portland "Oregonian" states that G. W. Hunt has left that city with a complete railway construction outfit for Fort Bragg, Cal., where he is to commence at once the construction of a railway 100 miles in length from Fort Bragg, at the mouth of the Noyo River, up the river to Willets, in the Little Lake Valley, and thence up the main fork of the Eel River to the Mount Vernon coal fields, owned by John W. Mackay and James L. Flood. The incorporation of this railway company was noted May 31; capital stock, $2,510,000; directors, Barclay Henley and T. L. Johnson, San Francisco; Calvin Stewart, Fort Bragg, Cal.; G. W. Hunt, Walla Walla, Wash.; R. S. Strahan, Portland, Ore.

SALT LAKE, LOS ANGELES & PACIFIC.—Efforts are being made to unite the several schemes for a railway from Salt Lake City to Los Angeles, Cal. The plan is stated as to utilize the Utah Central from Salt Lake City to Milford, Utah, complete the road graded several years ago by the Union Pacific from Milford to Pioche, Nev., and build from the latter place to a connection at Vanderbilt, Cal., with the Nevada Southern, which is completed from Blake, Cal., north to Vanderbilt. From Blake to Los Angeles it is proposed to build a new road. The 110 miles of graded road from Milford, Utah, to Pioche, Nev., were purchased some time ago by J. R. De Lamar, as noted in our issue of July 5. He has already begun work on a branch from Pioche to the Ferguson mines. Isaac E. Blake, President Nevada Southern, and Mr. De Lamar are said to have made overtures to Col. Isaac Trumbo, Salt Lake City, the projector of the Salt Lake, Los Angeles & Pacific, to unite with them in the construction of the road, thus combining the interests now seeking an outlet from Utah to Los Angeles. Col. Trumbo is reported as saying that his company has completed the surveys for its proposed road and has secured ample terminal facilities at both Salt Lake City and Los Angeles. The road as projected will be an entirely independent line. A press report from Salt Lake City, Sept. 14, states that articles of incorporation have been filed for the Utah company, which takes in the Cullen Springs Co. mines, the Salt Lake & Los Angeles R. R. Co., the Saltair Beach Co., the Intermountain Salt Co. and about 600 acres of coal lands in Summit county; capital stock, $10,000,000; principal stockholders, Wilford Woodruff, Geo. Q. Cannon and Jos. Smith.

SUMMIT MINERAL.—Incorporated at Helena, Mont., Sept. 11, to build a railway in Lewis, Clarke, Jefferson and Deer Lodge counties; capital stock, $300,000; incorporators, Arthur G. Lombard, Cornelius Hedges, Wm. Dyer, John D. Wilson and Ogden A. Southward.

Foreign.

MEXICO.—A press report from the city of Mexico states as follows: Ground has been broken for the building of a railway, 14 miles in length, from the town of Ixtlahuaca, on the line of the Mexican National R. R., into a rich and almost impenetrable forest of Mani, owned and operated by a railway contracting firm of New Orleans. Immense quantities of charcoal and wood for fuel purposes are already on the ground waiting adequate means of transportation for shipment to this city.

CENTRAL AMERICA.—The bureau of the American Republics in Washington, D. C., is informed from Guatemala city that an Anglo-Dutch syndicate has put a surveying party in the field looking for the most feasible route for a railway to connect that city with the Tehuantepec Ry. It is understood that this Anglo-Dutch syndicate has in contemplation a system of railways for all of Central America.

STREET AND ELECTRIC RAILWAYS.

NEWBURGH, N. Y.—Surveys are being made for extending the electric railway operating between this city and Orange Lake to Walden.

PORTCHESTER, N. Y.—The Portchester, Rye & Mamaroneck Electric Ry. Co., has been incorporated to construct a railway about nine miles long; capital stock, $150,000; directors, J. W. Lounsbury, W. L. Ward, J. F. Mills, Portchester; Bernard Bruch, Rye; J. A. Tremper, Kinderhook; Wilson Miller, Valatie.

TARRYTOWN, N. Y.—The highway commissioners of Greenburg, in which are the villages of Tarrytown, Irvington, Dobbs Ferry, Hastings and a part of White Plains, granted a franchise to the promoters of the New York, Elmsford & White Plains Electric Ry. Co. to lay rails in the Tarrytown and White Plains road, and establish a trolley road.

CAMDEN, N. J.—Press reports state that arrangements are being made to extend the Camden, Gloucester & Woodbury Electric R. R. from Woodbury to Mantua, Pitman Grove and Glassboro. The right of way has been secured. Mullica Hill capitalists are negotiating for an extension to that place by way of Clarksboro, and it is reported that a line from Glassboro to Mullica Hill is contemplated. Should the road by either route reach Mullica Hill it will be extended to Swedesboro, 5 miles distant. Woodstown is only about 8 miles from Swedesboro, and when the trolley road reaches the latter place it will go on, by way of Harrisonville, to Woodstown, and will probably be extended 10 miles further to Salem.

NEW BRUNSWICK, N. J.—The council has passed an ordinance granting the New Brunswick City Ry. Co. a franchise to make extensions and to operate its line by electricity.

PATERSON, N. J.—The New Jersey Electric Ry. Co. has been incorporated with a capital stock of $2,000,000, to construct and to operate street railways already built. G. A. Johnson, Brooklyn; G. V. Turner, New York; Frank Irving, Jersey City; J. McGuinness, Jr., Ridgewood, N. J.; J. J. Scanlan, Paterson; H. R. Coursen, Newark.

SOMERVILLE, N. J.—The commissioners have granted a franchise to the New York & Philadelphia Traction Co. to construct its line through the main street. The question has been pending about two months.

VERONA, N. J.—The town board has passed an ordinance granting a franchise to the North Jersey St. Ry. Co. to construct its road through the township.

PHILADELPHIA, PA.—D. W. Sellers, Park Comr., has proposed a plan for an electric railway on Belmont Ave., in Fairmount Park, for a distance of one mile, estimated to cost $60,000.—The Northern Electric Passenger Ry. Co. has been incorporated with a capital stock of $100,000; incorporators, A. C. Milliken, Pottsville; C. H. Davis, S. S. Evans, Philadelphia.

POTTSVILLE, PA.—The Northern Electric Ry. Passenger Co. has been incorporated to build a railway 10 miles in length; capital stock, $100,000; Pres., A. C. Milliken.

READING, PA.—The Reading & Pottstown Electric Ry. Co. has been incorporated with a capital stock of $100,000; length of road, 16 miles; Pres., J. A. Rigg.

SHARPSBURG, PA.—The council has granted a franchise to the Sharpsburg, Etna & Millvale St. Ry. Co. to construct an electric line through this place. It is proposed to extend the line to Glenshaw.

SALEM, VA.—The Roanoke & Salem Electric St. Ry. Co. is making arrangements to extend its line.

IRONTON, O.—Heald & Holliday, bankers of this city, have awarded the contract for constructing and equipping an electric railway between Manchester and Winchester, 25 miles, to the Frazier-Highland Construction & Equipment Co., Chicago, for $200,000, according to a press report.

CHICAGO, ILL.—The Chicago Passenger Traction Co. has been incorporated with a capital stock of $1,000,000; incorporators, P. H. Haynes, William Riley, J. W. C. Jones.—The Jenney Electric Conduit Co. has been incorporated with a capital of $5,000,000, to manufacture and construct railway tracks, etc.; incorporators, J. M. Hill, L. A. Farnsworth.

MILWAUKEE, WIS.—The Petersen Electric Conduit Railway Construction Co. has been incorporated with a capital stock of $500,000; incorporators, A. E. Smith, William Meyst, H. S. Esch.

WAUKESHA, WIS.—Surveys have been completed and right of way is now being secured for the Waukesha Beach Electric R. R., about six miles in length. The maximum grade is 4% in the city and 2% on the open line. It is almost an air line with 6° maximum curve outside of town. No bridges will be required. Engr., W. Powrie, Waukesha.

COUNCIL BLUFFS, NEB.—It is reported that definite arrangements are being made for the construction of an electric railway to Lake Mamawa. The county supervisors have been petitioned for right of way. E. H. Odell is interested.

OMAHA, NEB.—The Dodge St. Cable Ry. is to be converted into an electric line, according to local papers.

JUNCTION CITY, KAN.—E. E. Godlove, late secretary of the Leavenworth Electric Ry. Co., is reported as interested in the construction of a proposed electric railway between this place and Fort Riley.

ALAMEDA, CAL.—The Alameda, Oakland & Piedmont St. Ry. Co. has been granted a franchise to construct an electric railway on several streets.

NEVADA CITY, CAL.—It is reported that an electric railway is to be constructed from this city to Grass Valley.

HIGHWAYS.

MASSACHUSETTS.—It is reported that the state highway commissioners are preparing to pave the turnpike road from Revere to Lynn, a distance of about three miles, with granite blocks.

RHODE ISLAND.—The construction of the Allen's Ave. boulevard, 80 ft. wide, along the west shore of Narragansett Bay, from Eddy St., Providence, to Pawtuxet Neck, a distance of 3½ miles, is being discussed. E. P. Taft, G. R. Babbitt, Col. J. L. Goff and others, of Providence, are interested and have petitioned the Cranston council for right of way.

OHIO.—Bids are asked until Sept. 29 for the purchase of $6,500 of 4% bonds for improving Tweed Ave., Hamilton county. G. C. Zimmerman, Clk. Comrs., Cincinnati.

BRIDGES.

PHILADELPHIA, PA.—The plans for the proposed railway bridge across the Delaware River have been completed by Wm. H. Brown, Ch. Engr., Pennsylvania R. R., and are now being considered by the secretary of war. The construction will be commenced as soon as possible after the plans are approved.

WASHINGTON, D. C.—Maj. Chas. E. L. B. Davis, U. S. Engr. Office, is reported as taking steps for the repair of the piers of the aqueduct bridge, for which $51,070 has been appropriated.

RALEIGH, N. C.—The Seaboard Air Line is reported about to build a steel bridge across the Pee Dee River, between Richmond and Darlington counties, in this state, to cost $40,000.

BIRMINGHAM, ALA.—Watkins & Hardaway, of this city, have been awarded the contract for the proposed bridge across the Cahaba River at Bane's Ford, at $5,845.

CINCINNATI, O.—Bids are asked by the board of administration until Oct. 4 for the construction of a concrete or stone wagon bridge over Park Ave., near Town Hill, in Eden Park.—Bids are asked by the county commissioners until Oct. 6 for the construction of an arch culvert in Springfield township.

CLEVELAND, O.—Bids are asked until Sept. 29 for constructing the substructure and until Oct. 3 for the superstructure of the South Rocky River bridge. J. C. Dorn, Clk. County Comrs.

TOLEDO, O.—The following bids were received for the proposed St. Clair St. bridge over Swan Creek, the contract being awarded to the Massilon Bridge Co., at $25,000:

Youngstown Bridge Co.	$25,400
N. Henahan & S. Buehle	24,997
Toledo Bridge Co.	$19,500, $20,500, 23,500
Massilon Bridge Co.	$25,975, 37,000
King Bridge Co.	24,950
Variety Iron Wks. Co.	20,600
Ohio Bridge Co.	$21,700, 24,000

ASHLAND, WIS.—The contract for the masonry work for the Second St. bridge has been awarded to Archie Donald, at $6,775.

MUSCATINE, IA.—Bids are asked until Sept. 22 for the construction of the approaches to the new county bridge. Bert C. Benham, County Audr.

SHERMAN, TEX.—Bids are asked until Oct. 10 for one or more iron bridges. T. W. Hudson, Clk. Comrs. Court.

YANKTON, S. DAK.—A. J. Tullock, Pres. Missouri Valley Bridge & Iron Wks., Leavenworth, Kan., was in the city last week arranging with Senator Pettigrew, according to reports, for the early construction of the proposed combination railway and wagon bridge across the Missouri River at this place. The plans for the bridge have been approved by the secretary of war and are now in possession of Robt. J. Gamble, Pres. Yankton Bridge Co. It is stated that the bridge will be 1,100 ft. in length, have a draw span and cost about $400,000.

HELENA, MONT.—The county commissioners received bids from 8 local contractors for the grading and masonry foundations for the proposed bridges at Montana Ave. and near Broadwater and the following bids for the superstructures: Geo. E. King Bridge Co., Des Moines, Ia., $1,862 and $1,028; O. A. Peppard, Missoula, $2,100 and $1,280 or $1,360; Wrought Iron Bridge Co., Canton, O., $1,667 to $2,067 and $1,050 to $1,665; Youngstown Bridge Co., Ohio, $2,695 for both; Wisconsin Bridge Co., Milwaukee, $2,639 for both; Farasworth-Blodgett Co., Kansas City, $1,950 and $1,350; Toledo Bridge Co., Ohio, several bids from $1,200 to $3,900; King Bridge Co., Cleveland, O., $2,129 for both and $1.25 per ft. for hand rail; Milwaukee Bridge & Iron Wks., $1,463 and $1,825 for one, and $1,169 and $1,334 for the other; Gillette-Herzog Mfg. Co., $2,384 and extra for hand rails. The bids for grading ranged from 17 cts. to 40 cts. per cu. yd. The lowest bid on the masonry for the abutments was $7, the lowest local bid being $9.34 per cu. yd.

MONTREAL, QUE.—The plans for the new bridge over the Grand Trunk Ry., at Mountain St., have just been completed at the road department by S. Howard, acting under the direction of P. W. St. George, Cy. Surveyor. The plans show a bridge running from near St. Antoine St. to near Notre Dame St., having a total length of 720 ft. with cut granite piers at either end.

WATER-WORKS.

PITTSFIELD, ME.—The construction of the works is expected to be commenced at once. Specifications call for 6½ miles of pipe and 62 hydrants.

BETHEL, VT.—W. H. Creamer is a member of a committee to buy a steam pump and build a pump house.

MORRISVILLE, VT.—The citizens have voted to issue $21,000 in bonds for new works to be constructed at once. Consult. Engr., Joel Foster, Montpelier, Vt.

ACTON, MASS.—A committee has been appointed to engage an engineer to make surveys for a supply.

CAMBRIDGE, MASS.—Bids are asked until Sept. 24 for the construction of a 40,000,000-gallon reservoir at Payson Park. The bids recently received for this work are published under Contract Prices. L. M. Hastings, Cy. Engr.

HALLOWELL, MASS.—The committee has located a supply, and has been instructed to employ an engineer to make plans and estimates, the cost not to exceed $75,000.

LAWRENCE, MASS.—The adoption of the meter system is being considered.

MEDFORD, MASS.—Bids are asked until Oct. 1 for a stand-pipe, as stated in our advertising columns. T. Howard Barnes, Cy. Engr.

WESTHAMPTON, MASS.—The Westhampton Water Co. is reported about to receive bids for constructing works.

CROMWELL, CONN.—The question of works is again being considered.

WILLIMANTIC, CONN.—It is stated that plans have been prepared for a 2,000,000-gallon steam pumping plant.

FORT PLAINS, N. Y.—The present contract has expired and there is talk of putting in new works.

HORSEHEADS, N. Y.—The question is again being discussed.

LAKEWOOD, N. Y.—It is stated that $15,000 in bonds will be issued for works, the construction of which will be commenced within 60 days; supply from springs five miles distant.

LEE CENTER, N. Y.—The Lee Center Spring Water Co. is talking of laying a new main.

LE ROY, N. Y.—G. B. Bassett, Buffalo, is sinking test wells for a new supply, the present supply from a creek being too salt for domestic use.

ROCKVILLE CENTER, N. Y.—The residents are again discussing the question of works. W. H. Connell is village clerk.

HARRISON, N. J.—It is stated that this place and Kearny will advertise for bids for a new water supply, to take the place of the unsatisfactory supply now obtained from the Jersey City works at Belleville, which the two towns have determined to abandon.

A supply would be contracted for with Newark, but the contract of Newark with the East Jersey Water Co. forbids the sale of water except to a few adjoining townships in Essex county. The towns have already received several bids for a supply.

JERSEY CITY, N. J.—Bids are asked until Oct. 22 for a daily supply of 20,000,000 to 50,000,000 gallons to be delivered by gravity to Belleville and Jersey City reservoirs. G. T. Bouton, Clk. Bd.

MOORESTOWN, N. J.—The water company is trying to secure an additional supply.

EAST BANGOR, PA.—The question of works will be voted upon in November.

GORDON, PA.—The Hadesty Water Co. has been organized and is taking steps to put in works.

RIDGEWAY, PA.—Bids will probably be asked within 30 days for extensions, for which H. Little is making estimates. W. H. Hyde, Pres. Council.

WILKES BARRE, PA.—The Lehigh & Wilkes Barre Coal Co. is reported about to construct a 2,000,000-gallon reservoir.

RONCEVERTE, W. VA.—Bids are asked until Sept. 22 for constructing works, including stand-pipe, boilers, etc. F. H. Denning, Recdr.

ELIZABETH CITY, N. C.—The question of works for fire protection is being investigated. W. C. Glover, Mayor.

PALM BEACH, FLA.—Works will be put in at once by McGuire & McDonald, contractors.

MIDDLEBORO, KY.—The works will be sold Oct. 1 by order of the court. It is stated that it will take about $50,000 to put the plant in proper condition.

ARLINGTON HEIGHTS, O.—The citizens have voted to issue $6.000 in bonds for works.

COLUMBIANA, O.—It is reported probable that the question will soon be voted upon by the people.

LEETONIA, O.—The contracts for extending the works will be let in about a week, according to reports.

RIVERSIDE, O.—An election will be held Oct. 15 to vote on an issue of $50,000 in bonds for works. Rogers Wright, Mayor.

SPRINGFIELD, O.—Contracts have been awarded as follows, according to local papers: Pump house, O. N. Bartholomew, $18,213; pipe for connecting wells, Addystone Pipe & Steel Co., $17.70 per ton; 36-in. valve, Eddy Valve Co., $150.

WARREN, O.—It is reported that a filter plant, similar to the one now in operation at Knoxville, Tenn., will be put in.

WOOSTER, O.—Minor Scovel is engineer for the commission appointed to secure a supply. W. J. Mullins, Secy.

ZANESVILLE, O.—L. G. Halleck, Wheeling, W. Va., has been awarded the contract for extending the 30-in. intake 400 ft., at $4,000, according to reports.

BRIGHTWOOD, IND.—The town will soon put in works, including about four miles of mains; supply from deep well. Wm. Sanders is a member of the committee.

PORTLAND, IND.—The contract for works is reported to have been awarded to F. Bimel, Portland, at $45,000.

LAKEVIEW, MICH.—The question of works will soon be voted upon, according to reports.

ONTONAGON, MICH.—The citizens have voted to issue bonds for works and it is stated that the construction has been already commenced.

ROCHESTER, MICH.—The citizens have voted to issue $15,000 in bonds for works; supply from a spring two miles distant and 110 ft. higher than the village.

CHICAGO, ILL.—Bids are asked until Oct. 11 for two 14,000,000-gallon horizontal pumping engines, two 15,000,000-gallon vertical compound pumping engines and one 30,000,000-gallon triple expansion pumping engine, as stated in our advertising columns. H. J. Jones, Comr. Pub. Wks.

CHICAGO, ILL.—Bids are asked until Sept. 25 for laying mains in 32 streets. H. J. Jones, Comr. Pub. Wks.

DUNDEE, ILL.—Bids are asked until Sept. 13 for the purchase of $5,500 in 6% water bonds. C. F. Howard, Clk.

GERMANTOWN, ILL.—The council is considering the question of works.

GIBSON CITY, ILL.—Works will soon be constructed. Engr., John A. Cole, Chicago, T. D. Spalding, Mayor.

GROSSDALE, ILL.—The Grossdale Light & Water-Works Co. has been incorporated; capital stock, $500,000; incorporators, Willis Melville, Paine Harrington, O. E. Taylor, Warner Marti and Max Rathberger.

HOMER, ILL.—The village board is negotiating for a site for sinking wells, and it is stated that an election will soon be held to vote on an issue of $4,950 in bonds for works.

KEMPTON, ILL.—The council is reported as receiving bids for a 60-ft. water tower, etc.

LA HARPE, ILL.—It is reported that the council has voted to put in works at a cost of $7,000.

ROSSVILLE, ILL.—Bids are asked until Oct. 1 for constructing works, the cost not to exceed $5,000. A well is now being sunk. S. W. McGuire, Village Clk.

TOLONO, ILL.—There is talk of putting in works.

VANDALIA, ILL.—Bids will be asked in a few days for constructing works; supply from river; population, 3,500. Engr., Hiram Phillips, St. Louis. A. C. Walter, Cy. Clk.

CLINTON JUNCTION, WIS.—The citizens have voted to issue $13,000 in bonds for works.

COLUMBUS, WIS.—The council has engaged an engineer to prepare plans for works.

LANCASTER, WIS.—It is stated that works to cost $20,000 will be constructed.

REEDSBURG, WIS.—The city has sold the $25,000 in bonds voted for works and electric lights for $25,187.50.

TOMAH, WIS.—The citizens have voted to issue $15,000 in bonds for works.

AKRON, IA.—The citizens have voted to issue bonds for works.

BANCROFT, IA.—Bids are asked for erecting tank and laying mains; only $5,000 available at present; contract for 4½-in. well let to local parties; population, 1,000. W. F. Laidley, Jr., Cy. Clk.

CEDAR RAPIDS, IA.—A proposed extension of the franchise of the water company provides that the company must have a filtering plant in operation by June 1, 1895, and also that it shall lay an additional main not less than 12 ins. in diameter across the Cedar River before that date.

LISBON, IA.—Plans for works will be on file after Sept. 20, as stated in our proposal columns. W. H. Runkle, Mayor.

SIGOURNEY, IA.—The water-works proposition was carried Sept. 10 by a vote of 377 to 58.

WALKER, IA.—The village recently voted for works, but a press report states that injunction proceedings have been commenced by one resident restraining the construction, lest the proposed stand-pipe might blow down and kill his children.

CHATFIELD, MINN.—The citizens have voted $5,000 in bonds for extensions.

DULUTH, MINN.—The Duluth Gas & Water Co. has offered to sell its plant to the city for $294,000 and the city to assume the bonded indebtedness of $1,812,000. A definite reply is asked for within 40 days.

GLENCOE, MINN.—An election will be held Oct. 1 to vote on an issue of $25,000 in bonds for works.

PRESTON, MINN.—The question of issuing bonds for works was carried by 65 majority. J. P. Tibbetts, Mayor.

NILES, MICH.—Bids are asked until Sept. 25 for the construction of works, as stated in our advertising columns. Consult. Engr., Geo. W. Sturtevant, Jr., Chamber of Commerce Bldg., Chicago. B. F. Earl, Chn. Com.

NEW CASTLE, NEB.—Chas. W. Woodward, Cy. Clk., writes us that works will probably not be put

SYRACUSE, NEB.—The following bids were received Sept. 6; Consult. Engr., A. A. Richardson, Lincoln:

Pomerene & Cooper, Lincoln	$10,650
Fremont Foundry Co., Fremont	10,847
E. A. Rudiger, Nebraska City	10,868
Miller & Egan, Nebraska City (aw'd contract).	10,523

SALISBURY, MO.—The citizens have voted, 288 to 94, to issue bonds for works.

WAXAHACHIE, TEX.—The contract for a stand-pipe has been awarded to the Elmore Iron Wks., Birmingham, Ala.

SHERIDAN, WYO.—The town has sold its water bonds and entered into contract with E. A. Rudiger, Nebraska City, Neb., for the construction of a $75,000 gravity system of water-works. The work will be started immediately and every effort made to finish the system before winter. There will be 13 miles of pipe from 10 to 4-ins. in diameter, principally 8-in. pipe.

BALLARD, WASH.—The citizens voted Sept. 10 to issue $50,000 in bonds for works and electric lights.

PERRIS, CAL.—The Colony Heights Land & Water Co. has been incorporated with a capital stock of $35,000, by J. F. Davis, J. W. Name, G. T. McIntyre and others.

SANTA ROSA, CAL.—The council has voted to ask for bids for the construction of works and also for the purchase of $165,000 in 4% water bonds.

MONTREAL, QUE.—Bids are asked until Sept. 24 for a supply of cast iron pipe and special castings. A. Davis, Supt. W. W.

IRRIGATION.

LEXINGTON, NEB.—A press report states that active work has commenced upon the Farmers' & Merchant's Irrigation Co.'s canal, in Dawson county. Three graders and 100 scrapers have been bought and work will be given to 250 men upon the ditch. The ditch starts near Cozad and runs 28 miles east, and will water 50,000 acres. Ten thousand dollars in bonds were voted in Lexington precinct and $7,000 in Grant precinct to aid the construction. The capital stock is held entirely by local farmers and business men. Two smaller ditches are being constructed that will water 20,000 acres, adjacent to Lexington, and two companies are incorporated for extensive building south of the river. It is safe to say fully 200,000 acres will be put under irrigation in this county before another year.

BROWNWOOD, TEX.—Low & Low are reported as wanting plans and prices for a plant to irrigate 200 acres of land with 9 ins. of water in 15 days' time. It is desired to elevate this water 25 ft. and then carry it 400 yds.

LOVELAND, COLO.—A new reservoir for the Consolidated Home Supply Ditch & Reservoir Co. will be be built across the Yakima Indian Reservation will cost $10,500, and will supply water to irrigate 20,000 acres of ground.

YAKIMA, WASH.—It is stated that the ditch to be built across the Yakima Indian Reservation will tap the Yakima River five miles below this city and run 80 miles, putting about 150,000 acres of good level land under water. The survey for the definite line of location is being made.

SALT LAKE CITY, UTAH.—Judge J. S. Waters, Hailey, Idaho, is reported as making arrangements to construct a canal 12 miles in length, using the water of Green River to irrigate 50,000 acres in the Gunnison Valley.

NEW COMPANIES.—Hannah Irrigation Canal Co., Weir and Lisce, Cheyenne county, Neb.; $600; Hiram Fisk, F. T. Lisce, D. G. Hannah.——Battlement Reservoir Co., Denver, Colo.; $7,000; to build reservoirs near the line of Battlement Creek; Geo. J. Parmenter, Grevel Malin and others.——Clear Creek Irrigation & Mfg. Co., Menardville, Tex.; $10,000; W. L. Black, G. L. Rang, L. H. Rang.——Irrigation Securities & Colonization Co., Summit, N. J.; $60,000; to operate in New York and Chicago; T. B. Bryan, Chicago; J. M. Jones, Mountain Home, Idaho; H. E. Simmons, Summit, N. J.

SEWERS.

AMESBURY, MASS.—The question of a system is again being discussed; estimated cost, $70,000.

BROOKLYN, N. Y.—Bids are asked until Oct. 2 for constructing a sewer in 57th St. A. T. White, Comr. Cy. Wks.

CAZENOVIA, N. Y.—Bids are asked until Oct. 3 for constructing a system, as stated in our advertising columns. J. A. Loyster, Clk. Comrs.

NEW BRITAIN, CONN.—The following bids have been received for constructing 1,480 ft. of 48-in. and 400 ft. of 42-in. sewers in Berlin Ave.:

	Labor.	Total.
*Lawrence O'Brien, New Haven	$9,030	$13,535
A. A. Lyman, New Britain	16,300	19,852
A. McManus, Waterbury	13,271	15,271
M. S. Austin, New Britain	10,207	13,686
F. A. Cadwell, New Britain	14,408	17,960
Engineer's estimate	13,081	.....

* Awarded contract for labor.

PITTSBURG, PA.—Bids are asked until Sept. 22 for constructing 20 to 15-in. pipe sewers in 11 streets. E. M. Bigelow, Dir. Dept. Pub. Wks.

WAYNESBURG, PA.—The question of a system is being discussed.

YORK, PA.—The following bids have been received for constructing a 30-in. pipe sewer: James Thomas and J. J. Keesey, $9,999; Odenwalt & Hubert, $9,200, or $10,820 for a 48-in. brick sewer, for which the contract was awarded.

WILMINGTON, DEL.—The following bids have been received for constructing the sewers recently advertised: Anchorage St. sewer—Joseph McDonald & Co., Philadelphia, $10,800; John Jacoby, $7,693; Joseph Jenkins, $8,581; A. S. Reed, Bros. & Co., $8,256. Twelfth St. sewer.—Joseph Jenkins, $2,300; John Jacoby, $2,042; Frank McCulloch, Philadelphia, $3,178. Engr., T. C. Hatton.

WASHINGTON, D. C.—Bids are asked by the district commissioners until Sept. 22 for furnishing cement, broken stone, sewer brick, etc.

FORTRESS MONROE, VA.—Lieut.-Col. R. T. Frank, Maj. G. B. Davis and Capt. J. W. Pullman have been appointed to make arrangements for a system at Fort Monroe, provided for in the last appropriation bill.

JACKSONVILLE, FLA.—Bids are asked until Oct. 10 for supplying 160,000 to 305,000 ft. of 15 to 6-in. sewer pipe, as stated in our advertising columns. Consult. Engr., G. E. Waring, Jr. W. C. West, Recdr.

CLEVELAND, O.—Bids are asked until Sept. 26 for constructing house sewer and water connections in four streets. J. H. Farley, Dir. Pub. Wks.

NEWARK, O.—Bids are asked until Sept. 25 for constructing a pipe sewer in North Fourth St. W. A. Irvine, Cy. Clk.

CONNERSVILLE, IND.—Bids are asked until Oct. 2 for constructing 9,745 ft. of 18 to 6-in. pipe sewers, as stated in our advertising columns. Consult. Engr., J. A. Cole, Old Colony Bldg., Chicago. W. F. McNaughton, Cy. Clk.

INDIANAPOLIS, IND.—The board of public works has directed the city engineer to prepare plans for a sewer from 14th St. to White River, which will be about 19,000 ft. in length and is estimated to cost $100,000 to $125,000.

ANN ARBOR, MICH.—Bids are asked until Sept. 26 for constructing 26,497 ft. of 10 to 4-in. pipe sewers, 31 manholes, 25 flush tanks, etc. Cy. Engr., G. F. Key; W. J. Miller, Cy. Clk.

MILWAUKEE, WIS.—Bids are asked until Sept. 25 for constructing pipe sewers in two districts. G. H. Benzenberg, Cy. Engr.

MILWAUKEE, WIS.—The following contracts for constructing sewers have been awarded: D. O'Driscoll, pipe sewers, 97 cts. per lin. ft.; Jacob Werner, $1 per ft.; D. O'Driscoll, sewer in Orchard St., $1.03, and sewer in Lapham St., 99 cts.; and G. E. Zimmerman, Grant St. and 16th Ave., 89½ cts. The commissioner of public works is reported as stating that he has never seen work done so cheaply as at present.

ONTARIO, CAL.—A committee consisting of D. T. Cochran, C. R. Morse, Byron Ford and L. H. Peirson, has been appointed to investigate the subject of constructing a system.

STREETS.

LOCKPORT, N. Y.—The following bids have been received for paving Pine St.: C. N. Stainthrope & Co., John Porter, brick, $5,877; repressed Porter brick, $6,077; Park paving brick, $5,777; Park repressed brick, $5,877. Peter Gallbally, such brick as may be selected, $6,750. W. D. Sheldon, six varieties ranging from $5,640 to $6,600, awarded contract for Park repressed brick.

BROOKLYN, N. Y.—Bids are asked until Oct. 2 for repaving Dean St. with asphalt and repairing Fourth St. with asphalt. A. T. White, Comr. Cy. Wks.

NEW YORK, N. Y.—James Pollock has been awarded 21 out of 46 contracts for paving portions of 46 streets with granite blocks amounting to about $200,000. The total amount of the 46 contracts was about $340,000, the remaining contracts being divided among W. P. Bird, John G. Smith and P. H. McCullagh.

NEW YORK, N. Y.—Bids are asked by the department of docks until Oct. 4 for 1,000 sq. yds. of paving with Belgian blocks near piers 53 and 54, North River.

NIAGARA FALLS, N. Y.—The advertising for bids for paving a portion of Main St. is being discussed by the council.

SYRACUSE, N. Y.—The Bermudez Paving Co. of this city has been incorporated with a capital stock of $50,000; incorporators, Horace White, J. H. Drake, R. E. Drake and others.

NEWARK, N. J.—Bids are asked until Sept. 27 for 5,000 sq. yds. of trap block paving and 1,800 sq. ft. of Belgian bridging. J. C. Mundy, Gen. Supt. Pub. Wks.

ERIE, PA.—Bids are asked until Sept. 27 for paving 11th St. with asphalt or asphalt blocks. B. E. Briggs, Deputy Cy. Engr.

LAUREL, MD.—The city engineer has been directed to prepare plans for macadamizing two streets.

CINCINNATI, O.—Bids are asked by the board of administration until Sept. 25 for paving Bush Alley with brick.——The contract for paving Vine St., from St. Clair Ave. to the Zoological Garden, with asphalt has been awarded to Warren-Scharf Asphalt Paving Co., at $38,983. The Trinidad Asphalt Paving Co. bid $40,394.

COLUMBUS, O.—Bids are asked until Sept. 26 for grading and paving portions of three streets. J. A. Fanning, Cy. Clk.

NORWOOD, O.—Bids are asked until Oct. 6 for macadamizing several streets. W. E. Wichgar, Cy. Clk.

OAK HARBOR, O.—Bids are asked until Oct. 2 for

5,716 lin. ft. of No. 1 Berea stone paving; roadway 8 ft. wide, paving blocks, 8 × 5 × 10 ins.; estimated cost, $7,116. E. A. Smith, Cy. Engr.—We are informed that the following bids were received Sept. 1 for 4,070 sq. yds. of paving with brick on 6 ins. crushed stone foundation:

	W. Richardson, Port Clinton.	Jacobs & Stewart, Norwalk.
Canton standard shale, No. 1	$5,135	$5,653
Canton standard shale, No. 2	5,054	5,531
Canton standard repress, No. 1	5,208	.....
Canton standard shale block	5,420	.....
Salem-Garfield wire cut	5,217	5,694
Salem-Garfield repressed	5,257	5,938
Massillon brick	5,135	5,571
Jones brick	5,339	5,440
So. Zanesville blue granite blocks	.....	*5,327
Hallwood blocks	.....	5,694
John Porter standard	.....	5,694

* Awarded contract.

MILWAUKEE, WIS.—Bids are asked until Sept. 25 for grading and curbing, also for paving one alley with stone. G. H. Benzenberg, Cy. Engr.

KANSAS CITY, MO.—The Kansas City Paving Co. has been incorporated with a capital stock of $50,000; incorporators, G. M. Venable, E. N. Bradbury, G. W. Harmell, William Bradbury, Topeka, Kan., and others. —The contract for paving 14th St. from Broadway to Virginia Ave. with Trinidad Lake asphalt has been awarded to the Barber Asphalt Paving Co., at about $55,000.

CLEBURNE, TEX.—The council has passed an ordinance for issuing $10,000 in bonds for street improvements.

DENVER, COLO.—The contract for paving 19th St. has been awarded to Hugh Murphy at $61,658. Seven bids were submitted, the highest being $78,339.

ELECTRIC LIGHT AND POWER.

WAKEFIELD, MASS.—The town has voted to issue $20,000 in bonds for enlarging the electric light plant.

KINGSTON, N. Y.—Aug. Schepmoes, Cy. Clk., writes us that the following bids were received for the erection of an electric light plant: R. B. Tabor, $38,765, and G. F. Woolston, $29,846.

OSWEGO, N. Y.—Bids are asked until Oct. 15 for 190 450-watt arc lamps and 230 16-c.p. incandescent lamps for five years, each light to burn every night and all night. Consult. Engr., W. P. Judson.

HOMESTEAD, PA.—Frank and John Shepard and A. Shupe, Mount Pleasant, have petitioned for a franchise for the Mount Pleasant Electric Light & Heating Co., which proposes to build a plant to furnish light to East Homestead, Whittaker, Munhall and Six Mile Ferry.

ROCKWOOD, PA.—It is reported that a company has been organized to put in an electric light plant at this place, to be operated by water power.

CYNTHIANA, KY.—Bids are asked until Oct. 9 for lighting the city by electricity, as stated in our advertising columns. L. S. Williams, Cy. Clk.

CHILLICOTHE, O.—The Chillicothe electric railway and light plant has been sold to the General Electric Supply Co., Schenectady, N. Y., and others, for $20,100. The plant is reported as needing $30,000 worth of repairs.

COLUMBIANA, O.—The citizens have voted to issue bonds for the erection of an electric light plant.

WAPAKONETA, O.—The issuing of $7,000 in bonds for an electric light plant is being discussed by the council.

INDIANAPOLIS, IND.—Bids are asked until Sept. 26 for constructing and operating two cascades, the work requiring dynamos, gas engines, pumps, etc. Pres., G. J. Langsdale; Arch., L. H. Gibson, 84 E. Market St.

TERRE HAUTE, IND.—The council has adopted a resolution to advertise for bids for street lighting.

LISBON, IA.—Plans have been made for an electric light plant, as stated in our proposal columns. W. H. Runkle, Mayor.

OLIVA, MINN.—Braun & Kaubasch are erecting a mill in connection with which they will put in an electric light plant for the town.

OMAHA, NEB.—The council is discussing a resolution providing for an issue of $200,000 in 5% bonds for a municipal electric light plant.

CLEBURNE, TEX.—Thomas, Bender & Mink have petitioned for an electric light franchise.

FLORENCE, COLO.—A franchise for an electric light plant has been granted to Denver parties.

NEW COMPANIES.—American Electrical Heater Co., Detroit, Mich.; $50,000; to manufacture heating and cooking devices, dynamos, electrical appliances and motors; B. H. Scranton.—Block Lighting & Power Co., No. 1, New York; $50,000; Robert Stafford, A. M. Palmer, Edward Lauterbach.—Monticello Light, Heat & Power Co., Monticello, N. Y.; $20,000; F. B. Hulse, Thompsonville; M. E. Stone, New Brighton; H. R. Hulse, New York.

MISCELLANEOUS CONTRACTS AND SUPPLIES

STEEL PIPE.—Milwaukee, Wis.—Bids are asked until Sept. 25 for 10,000 ft. of 2½-in. steel pipe. G. H. Benzenberg, Cy. Engr.

ARMORY BUILDING.—Hornellsville, N. Y.—Bids are asked until Oct. 3 for the erection of an armory building in this city. Arch., I. C. Perry, Capitol, Albany.

EXPOSITION BUILDINGS.—Atlanta, Ga.—Bids will be received about Oct. 1 for the construction of the Cotton States & International Exposition Co.'s buildings, for which the plans and specifications are now being prepared by Bradford L. Gilbert, 50 Broadway, New York. Address Grant Wilkins, Chn. Com., Atlanta.

DREDGING.—Boston, Mass.—The following bids were received by the harbor commissioners Sept. 4 for dredging the shoal off north ferry slip: Boynton Bros., Boston, $5,100; New England Dredging Co., Boston, $4,950; Eastern Dredging Co., Portland, Me., $4,650 (accepted).

Baltimore, Md.—Bids are asked until Oct. 11 for dredging the ship canal leading to Baltimore harbor, as stated in our advertising columns. Col. Wm. P. Craighill, U. S. Engr. Office.

Washington, D. C.—Bids are asked until Oct. 17 for dredging in Occoquan and Aquia creeks, Va., as stated in our advertising columns. Maj. Chas. E. L. B. Davis, U. S. Engr. Office.

New York, N. Y.—Bids are asked until Oct. 11 for dredging Red Hook shoal, in Buttermilk Channel, N. Y., as stated in our advertising columns. Lieut. Robt. McGregor, U. S. Engr. Office.

DREDGING PLANT.—Buffalo, N. Y.—Bids are asked until Oct. 15 for the hire of a dredging plant, including drill boat, for use on the Niagara River, between Tonawanda and Fort Day, as stated in our advertising columns. Maj. E. H. Ruffner, U. S. Engr. Office.

REMOVING ROCK, ETC.—Detroit, Mich.—Bids are asked until Oct. 12 for removing shoals of boulders, both bedded and loose, and other material, from vicinity of Ballards Reef, in Detroit River. Col. O. M. Poe, U. S. Engr. Office.

STEEL ROOF.—Chicago, Ill.—Bids are asked until Sept. 25 for the construction of a steel roof for the new electric light station to be erected at 299 and 301 South Halsted St. and 42 Blue Island Ave. H. J. Jones, Comr. Pub. Wks.

DISINFECTING PLANT.—San Diego, Cal.—Bids are asked until Sept. 28 for the construction of a disinfecting plant for the U. S. quarantine station, this city. The bids recently received for this work were published in our issue of Sept. 6. Address Jeremiah O'Rourke, Supervising Arch., Treasury Dept., Washington, D. C.

GARBAGE CREMATORIES.—St. Paul, Minn.—The city clerk has been authorized to advertise for bids for a garbage crematory to be located on one-half an acre of land to be specified by the committee. Several plans have been under consideration by the council for some time.

McKeesport, Pa.—It is stated that a garbage crematory will be erected.

Albany, N. Y.—Dr. F. C. Curtis has reported to the health board in regard to a proposed garbage crematory, which was authorized by the last legislature.

CANAL REPAIRS.—Albany, N. Y.—Bids are asked until Sept. 28 for work of protecting the berme bank of the Cayuga and Seneca canal, at the foot of Seneca Lake. Edward Hannan, Supt. Pub. Wks.

DITCHING.—St. Paul, Minn.—Bids are asked until Sept. 24 for labor and material necessary to cutting ditches, as follows: In Traverse county, for improving the Mustinka River; in Grant county, for improving the Rabbit River; in Wilkin county, for improving the Ottertail River; and in Kittson county, for improving the Kennady ditch, all in accordance with specifications on file in the office of the Secretary of State. Ezra G. Valentine, Pres. Bd. of Red River Valley Drainage Comn.

LAND RECLAMATION.—Islip, N. Y.—Bids are asked until Oct. 5 for filling about 77½ acres of salt marsh land on the Great South Bay, as stated in our advertising columns. Eugene R. Smith, Engr. in Charge.

LEVEE WORK.—New Orleans, La.—Bids are asked for constructing levees as follows: Until Sept. 24, 4 contracts; Sept. 25, 13 contracts; Sept. 26, 9 contracts. Capt. John Millis, U. S. Engr. Office.

ENGINE HOUSE—Buffalo, N. Y.—Bids are asked until Oct. 3 for the erection of an engine house. R. G. Parsons, Secy. Dept. Pub. Wks.

JETTY WORK—Quintana, Tex.—It is stated that Civil Engineer Wisner, Detroit, Mich., arrived Sept. 14 to begin a survey for proposed river and jetty works for parties interested in property here and at other points in Brazoria county.

FILLING—Baltimore, Md.—Bids are asked until Sept. 26 for 2,000 cu. yds. of earth filling. J. T. Oster, Inspector of Bldgs.

SURVEYING—Washington, D. C.—The secretary of the interior has directed the commissioner of the general land office to advertise for bids for making a resurvey of Grant and Hooker counties, Neb., for which $16,000 has been appropriated.

REFORMATORY BUILDING.—New York, N. Y.—Bids are asked until Oct. 2 for the erection of the Eastern New York reformatory building, at Napanock. Arch., J. R. Thomas, 160 Broadway.

SPRUCE TIMBER.—New York, N. Y.—Bids are asked by the department of docks until Oct. 4 for a supply of 3 and 4-in. spruce plank.

RIPRAP STONE.—Washington, D. C.—Bids are asked until Oct. 17 for furnishing riprap stone at Occoquan Creek, Va., as stated in our advertising columns. Maj. Chas. E. L. B. Davis, U. S. Engr. Office.

PUBLIC BUILDING.—Allegheny, Pa.—Bids are asked until Oct. 12 for the excavation, walls, etc., for constructing the first floor of the U. S. public building in this city, as stated in our advertising columns. Address Jeremiah O'Rourke, Supervising Arch., Treasury Dept., Washington, D. C.

CONTRACT PRICES.

DRAINAGE CANAL.—Chicago, Ill.—The detailed bids for constructing section 15 of the Chicago drainage canal have been made public. The total bids were published Aug. 30, the lowest being Wright, Meysenberg, Sinclair & Carry, of Chicago, who obtained the contract. The following is a detailed list of the bids received:

Bidder.	—Price, per cu. yd.— Glacial drift.	Solid rock.	Ret'n'g wall.
E. D. Smith & Co., Romeoville, Ill.	$.25	$.68	$3.25
Christie, Lowe & Co., Chicago, Ill.	.40	.65	3.10
C. E. Loss, Chicago, Ill.	.17	.83	3.00
Lewis M. Loss, Chicago, Ill.	.25	.69½	2.17
Heidmaier & Neu, Chicago, Ill.	.26	.68 9-10	2.50
Mallory, Cushing & Co., Omaha, Neb	.34	.63	2.95
Campbell, Dennis & Co., Joliet, Ill.	.20	.63	2.65
McDonald & Penfield, Fremont, Neb.	.35	.67½	2.60
J. D. Moran Mfg. & Const'n Co., St. Paul	.20	.68	2.75
Dwyer, McNaughton & Co., Buffalo	.35	.72½	3.25
Fruin-Bambrick Constn Co., St. Louis	.25	.72 6-10	3.00
Mason, Hoge & Co., Frankfort, Ky.	.27	.73	3.55
H. B. Herr & Co., Chicago, Ill.	.25	.73½	2.75
Halvorson, Rich'ds & Co., Minneapolis	.25	.69	2.70
Andrew Onderdonk, Chicago, Ill.	.30	.63	3.00
Rickert, King & Clement, New York	.30	.66	3.20
Panama Const'n Co., Chicago, Ill.	.35	.67	3.00
Lauer, Hagaman & Co., Rochester	.29½	.72½	3.71
F. C. Weir, Cincinnati, O.	.35	.64	3.00
Winston Bros. & Stevens, Minneapolis	.22	.72	3.72
R. A. Malone & Sons, Philadelphia	.38	.74	2.60
J. A. McMurtie & Co., Denver, Colo.	.30	.71	2.25
Ezekiel Smith, Chicago, Ill.	.30	.68	3.25
Wright, Meysenburg, Sinclair & Carry	.19	.59	2.35
Henkel & Sullivan, Cincinnati, O.	.30	.74	4.25
Hayes Bros., Janesville, Wis.	.26	.69	3.20
Powell, Mitchell & Co., Marquette	.25	.68	3.25
W. F. Callahan, Omaha, Neb.	.19½	.69½	2.75
Moorman, Winfree & Co., Lynchburg	.35	.70½	3.75
Dawson & Tilden, Chicago, Ill.	.25	.85	3.25
Hill-O'Meara Const'n Co., St. Louis	.30	.69½	2.15
Grace & Hyde Co., Chicago, Ill.	.18	.77	2.40
Prendergast & Murphy, Chicago, Ill.	.19	.73	3.00
Angus & Gindele, Chicago, Ill.	.29½	.74½	3.38
Probst Const'n Co., Chicago, Ill.	.60	.74	3.00

The estimated quantities contained in this contract are 35,300 cu. yds. of glacial drift, 639,000 cu. yds. of solid rock and 40,000 cu. yds. of retaining wall, which at the prices bid by the successful bidders, makes the total contract price for the work, $477,717.

SEWERS.—Bound Brook, N. J.—The contract for constructing the sewers recently advertised has been awarded to Maguire, McKnight & Co., as stated in our issue of Sept. 13. The average cut is 8½ ft. and the engineers' estimate $20,405. H. M. Herbert, Engr., informs us that the bids were as follows:

Bids Received at Bound Brook, N. J., Sept. 4, 1894, for Constructing Sewers.

Bidder.	Cast iron, 20-in.	—Vitrified pipe sewer, per lin. ft.— 18-in.	15-in.	12-in.	10-in.	House branches, 8-in.	6-in.	—Drain.— 6-in.	4-in.	Flush tanks.	—Manholes.— Cir.	Drop.	Ellip.	Lamp holes.	Hemlock, M. ft.	Concrete.	Total.
Jones & Wallace, Philadelphia	$2.85	$2.49	$1.46	$0.62	$0.56	$0.60	$0.57	$0.32	$0.30	$54.00	$23.50	$27.00	$25.00	$5.90	$30.00	$6.00	$23,500
Maguire, McKnight & Co., Buffalo	$3.20	2.00	.94	.44	.47	.47	.27	.16	.14	75.00	31.00	35.00	29.00	7.00	30.00	8.00	19,140
Bernard Brady, Plainfield, N. J.	4.70	2.80	.92	.44	.48	.51	.36	.12	.10	72.00	46.00	48.00	43.00	10.00	20.00	6.00	22,396
John Shields, Flemington, N. J.	3.85	1.76	.88	.59	.41	.41	.28	.19	.16	75.00	54.00	54.00	50.00	10.00	20.00	5.50	20,583
Joseph Hendler, Wilkes Barre, Pa.	2.91	3.23	1.08	.42	.44	.40	.32	.18	.15	74.00	40.00	41.00	40.00	8.50	30.00	7.00	20,708
S. Ayres, Jr., Bound Brook, N. J.	2.95	1.70	1.20	.45	.42	.40	.23	.15	.10	75.50	54.75	54.75	52.80	11.50	20.00	4.75	20,960
Headly & Christie, Newark, N. J.	3.97	2.56	.88	.45	.46	.46	.30	.30	.25	80.00	32.00	37.00	30.00	12.00	20.00	5.00	19,716
P. H. & W. Rehill, Jersey City, N. J.	3.75	2.10	1.75	1.60	1.40	1.20	.65	.40	.25	55.00	45.00	45.00	45.00	10.00	20.00	5.00	40,252
Joseph Gallow & Co., 41 Marion St., N. Y.	5.00	2.00	1.00	.90	.73	.43	.40	.45	.40	85.00	40.00	40.00	40.00	10.00	30.00	5.00	22,600

ASPHALT PAVING.—Brooklyn, N. Y.—The following bids were received Sept. 6 for paving Putnam Ave., between Lewis and Sturtevant Aves., with asphalt:

	Cranford & Co.	T. D. Bradford.
Paving per sq. yd.	*$2.28	$1.87
Repair'g cobblestone pvg " " "	.30	.37
Resetting curb, etc. per lin. ft.	.35	.35
Redressing old curb " " "	.23	.20
New curb " " "	.70	.60
New bridgestones per sq. ft.	.40	.53

* Trinidad Lake asphalt, $2.28; Trinidad land or overflow asphalt, $1.50.

ASPHALT AND STONE PAVING.—Scranton, Pa.—The following bids were received Sept. 6, according to local papers, for paving: Pine St.—Dunn Bros., representing the Pennsylvania Asphalt Co., paving with Bermudez sheet asphalt, $2.90 per sq. yd.; stone blocks, $2.90; curbing, 67 cts. per lin. ft.; resetting old curb, 20 cts.; Barber Asphalt Paving Co., Trinidad asphalt, $2.58; stone blocks, $2.65; circular curbing, 92 cts.; resetting, 47 cts.; curbing with drain tile, 77 cts.; resetting curbing, 22 cts. (awarded contract). West Lackawanna Ave.—Dunn Bros., paving with Belgian blocks, $1.97 per sq. yd.; curbing, 97 cts. per lin. ft.; resetting old curbing, 17 cts.; Thomas McColville, P. J. Mares and B. M. Fox, paving, $2.01; curbing, 64 cts.; Nichols & Fahey, paving, $1.99; curbing, 49 cts.

BRICK PAVING.—Minneapolis, Minn.—The following bids were received for the repaving of Nicollet Ave. from Washington to Eighth St., with brick:

	Per sq. yd.
Iowa Brick Co.	$1.59
Thomas Reilly, St. Paul	1.37
Des Moines Brick Co.	1.65
Jas. E. Snyder,	$1.99 to 2.53
Tobin & Burke	1.79
N. S. Young, Burlington.	2.35
J. J. Palmer, Ashland Block, Chicago,	2.32
Minneapolis Paving & Brick Co.	1.90

Massillon, O.—The following bids were received for paving Summit St., with brick manufactured by the Paul or Massillon Stone & Fire Brick Co., the bidders being (L. & M.), H. W. Loeffler & G. W. Lemmon and J. B. Snyder:

	L. & M.	S.
Curbing, per lin. ft.	$.23	$.30
Redressing old curbing, per lin. ft.	.04½	.17
10-in. socket tile, per lin. ft.	.27	.20
Iron gutter bridges, per lb.	.03½	.05
Brick catch-basins, complete, each	22.00	30.00
Fire brick, per M.	12.00	12.00
Excavating, per cu. yd.	.24	.30
Gravel or sand f'ndat'ns, compl., cu.yd.	.10	.30
Filling and top dressing, per sq. yd.	.10	.10
All other labor and use of tools, sq. yd	.05	.25
Pavement, complete, per sq. yd.	1.17	1.15

Piqua, O.—H. E. Whitlock, Cy. Engr., writes us that the contract for brick paving, for which bids were

received Aug. 20, has been awarded to Gantz & Sullivan, Columbus, at $1.49 per sq. yd. for the Malvern blue granite block. Bids were received from nine contractors, the prices ranging from $1.48 to $3.10 per sq. yd. for the paving, $17 to $35 for catch-basins, 31 to 53 cts. for plain curbing (Berea), and 58 to 80 cts. for circular curbing.

Chester, Pa.—Jas. B. Campbell, Cy. Clk., writes us that the contract for paving Barclay St., from 7th to 9th, has been awarded to John Hanna, Chester, at $1.97½ per sq. yd. for the Savage iron shale brick made at Keystone Junction, Pa.

SEWERS.—St. Louis, Mo.—William Wise, Asst. Sewer Comr., has sent us a statement of the itemized bids received Aug. 28 for constructing sewers, and the lowest bids were noted in our issue of Sept. 6, under Sewers. The work in Pine St. includes 4,970 ft. of 4 × 5-ft. brick sewer, average cut 10¼ ft., the bids being as follows; appropriation, $18,000:

	Earth excav., 12,000 cu. yds.	Brick masonry, 2,320 cu. yds.	Junctions, 100 pieces.	Cast iron, 10,000 lbs.	Wrought iron, 650 lbs.	Total.
T. Maloney	$.25	$5.35	$.50	$.02	$.04	$15,688
Claus Veiths	.19	5.25	.45	.08	.03	15,324
A. & J. C. Heman	.20	6.00	.50	.03	.04	16,696
Abbott-Gamble Co	.26	6.09	.55	.025	.055	17,580
G. P. Prendergast	.20	5.10	.40	.03	.05	14,004
Mackler & Ful'rt'n	.25	5.50	1.00	.020	.035	16,173
Wycoff & Crean	.25	5.50	.30	.04	.05	16,222
*Hussey & Teese	.20	5.00	.40	.02	.025	14,256
Penny Meyers Co.	.19¼	5.34	.40	.025	.04	15,075
Hill, O'Meara Co.	.27	5.20	.60	.02¼	.04	15,615
Kendall Bros	.23	5.25	.50	.03	.03	15,300
Fruin-Bambrick	.25	5.25	.60	.03	.03	15,669
G. G. Prendergast	.20	5.00	.75	.02	.04	14,301
P. O'Donnell	.20	5.35	.60	.02	.02	15,085
F. McCabe	.20	5.50	.60	.025	.035	15,493
Skrainka C'st'n Co	.23	5.34	.40	.035	.04	15,565
G. Eyerman, Jr.	.25	5.50	.50	.03	.04	16,136

* Awarded contract.

The Fillmore St. sewer embraces 1,100 ft. of 8-ft. brick sewer, average cut 36 ft., and the bids were as follows, the appropriation being $14,500:

Bids Received at St. Louis, Mo., for Constructing an 8-ft. Brick Sewer in Tunnel.

Quantities.	A. & J. C. Heman, $13,522.	J. A. Lohrum, $17,571.	Stifel & Ruckert, $15,042.	Abbott-Gamble Const'n Co., $15,078.	G. P. Prendergast, $14,020.	H. Reuecking & Co., 15,180.	Fruin-Bambr'k Const'n Co., $14,198.	Penny Meyer* Const'n Co.	Wycoff & Crean, $15,430.	Hill, O'Meara Const'n Co., $15,441.	G. Eyerman, Jr., $15,213.	J. J. McGovern, $13,713.	Hussey & Teese, $14,495.
*Earth excav., 3,300 cu. yds.	$0.25	$0.30	$0.35	$0.35	$0.25	$0.30	$0.32	$0.23	$0.30	$0.25	$0.30	$0.30	$0.15
*Brick masonry, 210 cu. yds.	5.50	5.50	6.00	7.40	5.50	5.50	5.50	5.35	6.00	6.25	5.50	6.00	6.00
12-in. pipe sewers, 40 ft.	.60	.50	.70	.40	1.00	.50	.60	.50	1.00	.70	.40	.50	.75
Junctions, 40 pieces	.50	.50	1.00	.60	1.00	.50	.65	.50	.50	.60	.40	.50	1.00
Inlet stone, 54 sq. ft.	.50	.50	.50	.60	.50	.50	.65	.65	.60	.60	.50	.65	.40
Cast iron, 2,300 lbs.	.03	.02	.02	.025	.02	.02½	.02¼	.02½	.02	.02¼	.01½	.02¼	.02
Wrought iron, 500 lbs.	.04	.04	.04	.055	04	.04	.04½	.04	.03	.04	.04	.03	.02
*Vit. brick masonry, 13 cu.yds.	9.00	11.00	8.95	13.80	7.75	10.00	11.00	9.57	11.30	9.00	10.00	10.75	9.00
*Cut-stone masonry, 25 cu. yds.	15.00	12.00	10.00	14.00	22.00	15.00	12.00	14.75	18.00	10.00	15.00	7.00	15.00
8-ft. brick (tunnel), 1,100 lin. ft.	9.90	13.50	11.00	10.62	10.75	9.45	10.35	9.40	11.30	9.80	9.50	10.00	11.00

* Open cut. ** Awarded contract, $12,868.

RESERVOIR.—Cambridge, Mass.—L. M. Hastings, Cy. Engr., informs us that bids were received Aug. 31 for constructing the proposed reservoirs according to four plans, the itemized bids according to plan D and the total bids for plans A, B, C and D being as follows; bids rejected and new bids will be received until Sept. 24:

CEDAR BLOCK PAVING.—Moorhead, Minn.—A. J. Wright, Cy. Reedr., writes us that a contract for paving with cedar blocks upon 2-in. white pine plank on 1 × 8-in. stringers, laid on natural soil, has been awarded to McDonnell & Kennedy, the bids being as follows:

	Paving, per sq. yd.	Granite curb, per lin. ft.
M. Dooher & Co., Chippewa Falls	$1.28	$1.00
J. M. Bayer & M. Dalton, Moorhead	1.09	.98
M. C. Burk, West Superior, Wis.	.90	.74
McDonnell & Kennedy, Moorhead.	.90	.73

CONDENSED LIST OF CONTRACTS PENDING WITH DATE OF OPENING BIDS.

Bids to be opened.	Work.	Place.	See Eng. News.
Sept. 21.	Jail,	Ortonville, Minn	Aug. 30
Sept. 21.	Public buildings,	Washington, D. C.	Sept. 6
Sept. 22.	Brick paving,	Cincinnati, O.	Aug. 30
Sept. 22.	Rock removal,	Detroit, Mich.	Aug. 30
Sept. 22.	Dams, etc.,	Rock Island, Ill.	Aug. 30
	Advertised, Eng. News, Aug. 30 to Sept. 20.		
Sept. 22.	Macadamizing,	Cincinnati, O.	Sept. 13
Sept. 22.	Pipe sewers (11 streets),	Pittsburg, Pa.	Sept. 20
Sept. 22.	Sewer brick, etc.,	Washington, D. C.	Sept. 20
Sept. 22.	Water-wks. system,	Ronceverte, W. Va.	Sept. 20
Sept. 22.	Bridge approaches,	Muscatine, Ia.	Sept. 20
Sept. 24.	Brick paving,	South Bend, Ind.	Sept. 6
Sept. 24.	Asphalt paving,	Binghamton, N. Y.	Sept. 13
Sept. 24.	Paving,	Toledo, O.	Sept. 13
Sept. 24.	Railway (18 miles),	Rumford Falls, Me.	Sept. 20
	Advertised, Eng. News, Sept. 13 and 20.		
Sept. 24.	Reservoir,	Cambridge, Mass.	Sept. 20
Sept. 24.	Levee work,	New Orleans, La.	Sept. 20
Sept. 24.	Street imp'v't bonds,	Cincinnati, O.	Sept. 20
Sept. 24.	Ditching (4 contracts),	St. Paul, Minn.	Sept. 20
Sept. 24.	Cast iron pipe,	Montreal, Que.	Sept. 20
Sept. 25.	Stone,	Nashville, Tenn.	Aug. 30
	Advertised, Eng. News, Aug. 30 to Sept. 20.		
Sept. 25.	Crib repairs, etc.,	Washington, D. C.	Sept. 6
Sept. 25.	Officers' quarters,	Davids Island, N. Y. H.	Sept. 13
Sept. 25.	Lumber,	New Orleans, La.	Sept. 13
Sept. 25.	Levee work,	Memphis, Tenn.	Sept. 13
Sept. 25.	Dredging, etc.,	Chicago, Ill.	Sept. 13
	Advertised, Eng. News, Sept. 6 to 20.		
Sept. 25.	Levee work,	New Orleans, La.	Sept. 20
Sept. 25.	Brick paving,	Cincinnati, O.	Sept. 20
Sept. 25.	Steel roof,	Chicago, Ill.	Sept. 20
Sept. 25.	Laying w. mains (32 sts.),	Chicago, Ill.	Sept. 20
Sept. 25.	Water-wks. system,	Niles, Mich.	Sept. 20
	Advertised, Eng. News, Sept. 20.		
Sept. 25.	Grading, paving, etc.,	Milwaukee, Wis.	Sept. 20
Sept. 25.	Pipe sewers,	Milwaukee, Wis.	Sept. 20
Sept. 25.	Steel pipe,	Milwaukee, Wis.	Sept. 20
Sept. 26.	Sewers,	Sandusky, O.	Aug. 30
Sept. 26.	Paving,	Columbus, O.	Sept. 20
Sept. 26.	Pipe sewer,	Newark, O.	Sept. 20
Sept. 26.	Dynamos, etc.,	Indianapolis, Ind.	Sept. 20
Sept. 26.	Pipe sewers,	Ann Arbor, Mich.	Sept. 20
Sept. 26.	Filling (2,000 cu. yds.),	Baltimore, Md.	Sept. 20
Sept. 27.	Buildings,	Plattsburgh, N. Y.	Sept. 6
Sept. 27.	Iron work,	Charleston, W. Va.	Sept. 6
	Advertised, Eng. News, Sept. 6 to 20.		
Sept. 27.	Barracks, etc.,	Washington, D. C.	Sept. 13
Sept. 27.	Sewer bonds ($12,000),	Sandusky, O.	Sept. 6
Sept. 27.	Paving,	Erie, Pa.	Sept. 20
Sept. 27.	Stone paving,	Newark, N. J.	Sept. 20
Sept. 28.	Stone arch bridge,	Sandusky, O.	Aug. 30
Sept. 28.	Paving (10,174 sq.yds.),	Van Wert, O.	Aug. 30
	Advertised, Eng. News, Aug. 30 to Sept. 20.		
Sept. 28.	Water-wks. system,	Morrisville, N. Y.	Sept. 13
	Advertised, Eng. News, Sept. 6 and 13.		
Sept. 28.	Pipe sewers,	Elizabeth, N. J.	Sept. 13
Sept. 28.	Canal repairs,	Albany, N. Y.	Sept. 20
Sept. 28.	Disinfecting plant,	San Diego, Cal.	Sept. 20
Sept. 29.	Bridges,	Indianapolis, Ind.	Aug. 23
Sept. 29.	Water-wks. system,	Cattaraugus, N. Y.	Sept. 13
Sept. 29.	Jetties,	Savannah, Ga.	Sept. 13
	Advertised, Eng. News, Sept. 13 to 27.		
Sept. 29.	Bridge substructure,	Cleveland, O.	Sept. 20
Oct. 1.	Electric lighting,	Vicksburg, Miss.	Aug. 30
Oct. 1.	Water power canal,	Model City, N. Y.	Sept. 13
	Advertised, Eng. News, Sept. 13 to 20.		
Oct. 1.	Macadamizing,	Columbus, O.	Sept. 13
Oct. 1.	Paving,	Toledo, O.	Sept. 13
Oct. 1.	Water-wks. system,	Rossville, Ill.	Sept. 20
Oct. 1.	Stand-pipe,	Medford, Mass.	Sept. 20
	Advertised, Eng. News, Sept. 20.		
Oct. 2.	Electric lighting,	Jackson, Tenn.	Aug. 30
Oct. 2.	Water-wks. system,	Greenville, Mass.	Aug. 23
	Advertised, Eng. News, Aug. 23 to Sept. 13.		
Oct. 2.	Pipe, etc. (20 miles),	Beaver Falls, Pa.	Sept. 13
	Advertised, Eng. News, Sept. 13 to 27.		
Oct. 2.	Sewer,	Brooklyn, N. Y.	Sept. 20
Oct. 2.	Reformatory bldg.,	Napanoch, N. Y.	Sept. 20
Oct. 2.	Asphalt paving,	Brooklyn, N. Y.	Sept. 20
Oct. 2.	Stone paving,	Oak Harbor, O.	Sept. 20
Oct. 2.	Pipe sewers,	Connersville, Ind.	Sept. 20
	Advertised, Eng. News, Sept. 20 and 27.		
Oct. 3.	Bridge,	New Brunswick, N. J.	Sept. 13
	Advertised, Eng. News, Sept. 13.		
Oct. 3.	Dam, pump pit, etc.,	Dallas, Tex.	Sept. 13
	Advertised, Eng. News, Sept. 13 to 27.		
Oct. 3.	Sewer system,	Cazenovia, N. Y.	Sept. 20
	Advertised, Eng. News, Sept. 20 and 27.		
Oct. 3.	Armory building,	Hornellsville, N. Y.	Sept. 20
Oct. 3.	Bridge superstructure,	Cleveland, O.	Sept. 20
Oct. 3.	Engine house,	Buffalo, N. Y.	Sept. 20
Oct. 4.	Rubble stone (2 contracts),	Boston.	Sept. 6
	Advertised, Eng. News, Sept. 6 to 20.		
Oct. 4.	Dredging,	Boston, Mass.	Sept. 6
	Advertised, Eng. News, Sept. 6 to 20.		
Oct. 4.	Dredging,	Washington, D. C.	Sept. 6
	Advertised, Eng. News, Sept. 6 to 27.		
Oct. 4.	Stone, etc.,	Washington, D. C.	Sept. 13
	Advertised, Eng. News, Sept. 6 to 20.		
Oct. 4.	Dredging,	Washington, D. C.	Sept. 13
	Advertised, Eng. News, Sept. 6 to 20.		
Oct. 4.	Bridge,	Cleveland, O.	Sept. 13
Oct. 4.	Concrete or stone bridge,	Cincinnati, O.	Sept. 20
Oct. 4.	Spruce timber,	New York, N. Y.	Sept. 20
Oct. 4.	Belgian block paving,	New York	Sept. 20
Oct. 5.	Breakwater repairs,	Burlington, Vt.	Sept. 6
	Advertised, Eng. News, Sept. 6 to 27.		
Oct. 5.	Dredging (2 contracts),	Burlington, Vt.	Sept. 6
	Advertised, Eng. News, Sept. 6 to 27.		
Oct. 5.	Rock excavation,	Burlington, Vt.	Sept. 6
	Advertised, Eng. News, Sept. 6 to 27.		
Oct. 5.	Electric fixtures, etc.,	Denver, Colo.	Sept. 13
Oct. 5.	Land reclamation,	Islip, N. Y.	Sept. 20
	Advertised, Eng. News, Sept. 20 and 27.		
Oct. 6.	Arch culvert,	Cincinnati, O.	Sept. 20
Oct. 6.	Macadamizing,	Norwood, O.	Sept. 20
Oct. 9.	Electric lighting,	Cynthiana, Ky.	Sept. 20
	Advertised, Eng. News, Sept. 20 and 27.		
Oct. 8.	Rubble stone,	Boston, Mass.	Sept. 13
	Advertised, Eng. News, Sept. 13 to 27.		
Oct. 8.	Dredging,	Boston, Mass.	Sept. 13
	Advertised, Eng. News, Sept. 13 to 27.		
Oct. 9.	Buildings, etc.,	Washington, D. C.	Sept. 13
	Advertised, Eng. News, Sept. 20 to Oct. 4.		
Oct. 10.	Sewer pipe,	Jacksonville, Fla.	Sept. 20
	Advertised, Eng. News, Sept. 20 to Oct. 4.		
Oct. 10.	Iron bridges,	Sherman, Tex.	Sept. 20
Oct. 11.	Pumping engines,	Chicago, Ill.	Sept. 20
	Advertised, Eng. News, Sept. 13 to 27.		

BIDS FOR CONSTRUCTING PAYSON PARK RESERVOIR, PLAN D (MASONRY PARTING WALL AND CONCRETE FLOOR), CAMBRIDGE, MASS.

Quantities.	R. A. Malone, Lancaster, Pa.	Clement & Hegeman, New York.	Booth & Parry Bros., Cambridge.	Troy Public Wks. Co., Troy, N. Y.	Neill McBride, Brighton.	C. Linehan, Cambridge.	Jones & Meehan, Jamaica Plain.	Geo. M. Atkins & Co., Palmer.	National Const'n Co., Boston.	Arthur McMullen & Co., New York	Cranford & Co., Brooklyn, N. Y.	Geo. R. Newmark & Co Providence, R. I.	Conners & Co., Lowell.	W. H. Magee, West Newton.	Thos. F. Maney, Quincy Point.	Leavitt, Dailey & Crockett, Cambridge.	David Hall, Boston.	Moulton & O'Mahoney, Boston.
Earth excavation, 66,000 cu. yds.	$0.45	$0.28	$0.33	$0.42	$0.38	$0.53	$0.40	$0.40	$0.39	$0.41	$0.45	$0.45	$0.55	$0.65	$0.60	$0.60	$0.49	$0.50
Loam excavation, 5,000 cu. yds.	.25	.30	.19	.42	.38	.23	.28	.25	1.00	.25	.30	.30	.34	.24	.30	.35	.30	.40
Rock excavation, 8,000 cu. yds.	.90	.95	.10	.42	1.00	1.40	1.00	1.75	2.10	.95	1.30	1.60	1.65	1.50	2.50	1.40	1.30	1.75
Concrete (lining, 1 : 2 : 4), 6,600 cu. yds.	5.00	4.15	4.60	4.50	6.00	5.50	5.00	5.00	4.55	5.50	6.00	6.25	6.63	6.50	5.75	5.50	8.00	7.50
Concrete (lining, 1 : 1 : 3), 100 cu. yds.	6.00	4.75	5.17	5.00	7.00	6.00	5.50	5.50	4.55	7.50	7.25	7.85	7.45	7.50	6.00	6.50	8.00	10.00
Concrete (core), 3,200 cu. yds.	5.00	4.00	4.30	5.25	5.70	6.00	6.00	6.00	4.55	8.00	6.10	5.00	7.00	5.00	5.50	6.50	9.00	7.00
Concrete (foundation), 950 cu. yds.	5.00	4.15	4.60	5.25	5.00	5.50	5.00	5.50	4.55	7.50	6.00	6.25	7.38	5.00	5.75	6.50	7.50	7.00
Cement (American), 200 bbls.	1.50	1.40	1.27	1.00	1.10	1.30	1.30	2.00	1.30	1.50	1.25	1.25	1.03	1.50	1.50	1.20	1.40	1.50
Cement (Portland), 100 bbls.	2.50	2.50	2.60	3.00	2.50	2.65	3.00	3.00	2.55	2.50	3.50	2.60	2.28	2.75	2.00	3.00	2.60	3.00
Plastering, 44,700 sq. yds.	.25	.30	.27	.40	.40	.40	.60	.40	1.04	.45	.50	.48	.22	.50	.50	.70	.55	1.00
Broken stone, 4,250 cu. yds.	.75	1.95	1.85	1.50	2.50	2.75	2.25	2.50	2.00	2.00	2.85	2.25	3.25	2.50	3.33	2.50	2.75	2.50
Stone paving, 3,000 cu. yds.	2.00	6.00	10.12	9.75	6.00	3.75	7.75	7.50	7.50	8.50	9.75	9.75	6.90	7.20	7.00	7.00	9.00	8.00
Gravel walks, 1,650 sq. yds.	1.00	.60	1.15	.75	1.00	1.00	1.00	1.75	1.00	1.00	1.50	.95	.75	.75	1.20	1.50	2.50	1.75
Sodding, 15,900 sq. yds.	.30	.25	.45	.25	.20	.31	.40	.40	.60	.40	.30	.36	.27	.27	.25	.27	.45	.90
Seeding, 50M. sq. ft.	2.00	.50	2.30	.50	10.00	1.00	2.00	1.00	.03	2.50	1.00	.35	1.00	.005	.10	2.00	10.00	10.00
Granite rubble, 470 cu. yds.	6.00	7.10	10.65	12.00	6.00	10.00	8.00	8.00	11.15	7.50	5.50	9.00	7.15	6.00	8.00	10.00	19.00	11.00
Brick masonry, 110 cu. yds.	11.00	10.00	12.00	10.00	13.00	16.00	12.00	12.00	14.00	14.00	12.00	12.75	9.00	18.00	16.00	20.00	16.00	18.60
Dry rubble, 30 cu. yds.	3.00	5.25	9.10	9.75	4.50	3.00	4.00	7.00	6.35	7.00	4.50	3.50	5.00	4.00	6.00	5.00	7.50	8.00
Granite (dimension stone), 5 cu. yds.	40.00	25.00	23.00	25.00	30.00	20.00	30.00	50.00	20.73	24.00	33.00	20.00	19.00	14.00	28.00	25.00	40.00	50.00
" (leaded and caulked), 13 cu. yds.	40.00	27.00	25.00	25.00	35.00	22.00	30.00	55.00	23.23	26.00	45.00	25.00	23.00	15.50	35.00	25.00	40.00	75.00
Dressing stone (six cut), 750 sq. ft.	.40	.40	.58	.60	.70	.75	.60	.50	.53	.55	.70	.60	.65	1.50	.60	.60	.60	1.00
" (point), 3,100 sq. ft.	.30	.30	.46	.40	.60	.60	.40	.40	.45	.42	.55	.45	.43	1.00	.50	.60	.50	.80
Squared stone masonry, 2,000 cu. yds.	9.00	13.00	17.50	18.00	16.00	16.00	16.00	12.00	23.00	15.50	13.50	16.00	13.90	12.00	18.00	15.00	20.00	18.00
Granite coping, 490 lin. ft.	4.00	6.00	5.75	6.00	5.00	1.50	5.00	5.50	5.34	4.50	13.00	4.75	6.00	5.00	5.00	5.00	7.50	10.00
Flagging, 120 sq. ft.	.30	.40	1.00	1.00	1.30	.75	1.50	1.25	1.55	.60	2.00	.85	1.75	1.00	1.65	1.50	1.65	2.00
Total, Plan D.	$145,998	$152,693	$179,346	$192,702	$192,556	$198,810	$203,602	$195,342	$244,074	$209,209	$219,382	$218,497	$213,140	$217,167	$233,718	$229,238	$236,885	$279,157
" " A.	127,444	127,589	163,995	173,308	182,102	174,830	181,463	186,063	193,941	195,8 8	193,124	199,087	234,382	226,475	203,800	213,435	247 373	2 2,786
" " B.	124,282	128,857	151,517	192,328	168,893	168,894	176,398	176 898	200,502	182,318	193,956	193,990	196,070	201,480	202 078	202,445	233,43	245,026
" " C.	146,638	148,569	190,407	202,367	207,016	202,166	215,587	202,902	231,016	220,364	214,267	220,713	254,280	241,992	231,223	237,148	280,095	282,151

STONE.—Portland, Ore.—Capt. Thos. W. Simmons, U. S. Engr. Office, received the following bids Sept. 6 for stone for improvement of Coos Bay: R. A. Graham, Marshfield, Ore., 90 cts. per net ton; Daniel Kern, Portland, 63 cts. (accepted).

STONE PAVING.—Newark, N. J.—The contract for paving Plane St., between Broad and Market Sts., with oblong granite blocks, has been awarded to the N. J. Asphalt Co., at $3.09 per sq. yd.; bridging, 45 cts.

Oct. 11. Dredging (2 contracts), Norfolk, Va....Sept. 1.
Advertised, Eng. News, Sept. 13 to Oct. 4.
Oct. 11. Dredging, New York, N. Y.....Sept. 20
Advertised, Eng. News, Sept. 20 to Oct. 11.
Oct. 11. Dredging, Baltimore, Md.....Sept. 20
Advertised, Eng. News, Sept. 20 to Oct. 4.
Oct. 12. Public building, Allegheny, Pa.....Sept. 20
Advertised, Eng. News, Sept. 20 and 27.
Oct. 12. Removing rock, etc., Detroit, Mich....Sept. 20
Oct. 15. Hire of dredging plant, Buffalo, N. Y..Sept. 20
Advertised, Eng. News, Sept. 20 to Oct. 4.
Oct. 16. Pumps and reservoirs, Beaver Falls, Pa. Sept. 13
Advertised, Eng. News, Sept. 13 to 27.
Oct. 17. Electric lighting, Oswego, N. Y.....Sept. 20
Oct. 17. Riprap stone, Washington, D. C.....Sept. 20
Advertised, Eng. News, Sept. 20 to Oct. 11.
Oct. 17. Dredging, Washington, D. C.....Sept. 20
Advertised, Eng. News, Sept. 20 to Oct. 11.
Oct. 19. Jail cells, etc., Auburn, Cal.....Aug. 30
Oct. 22. Water supply, Jersey City, N. J.....Sept. 20
Oct. 31. Drawbridges, Chicago, Ill.....Sept. 6
Advertised, Eng. News, Sept. 6 and 20.
Oct. 31. Bridge masonry, Chicago, Ill.....Sept. 6
Advertised, Eng. News, Sept. 6 and 20.
Nov. 6. Filter plant, Beaver Falls, Pa.....Sept. 13
Advertised, Eng. News, Sept. 13 to 27.
No date. Canal work, Los Angeles, Cal.....Sept. 13
Advertised, Eng. News, Sept. 13 to Oct. 18.
" " Water mains, etc., Bancroft, Ia.....Sept. 20
" " Electric light plant, Lisbon, Ia.....Sept. 20
Advertised, Eng. News, Sept. 20.
" " Water-wks. system, Lisbon, Ia.....Sept. 20
Advertised, Eng. News, Sept. 20.

METAL MARKET PRICES.

LEAD.—New York: 3.1 to 3.2 cts. Chicago: 3 to 3.1 cts. St. Louis: 3.02 to 3.1 cts.

NAILS.—Pittsburg: $1 to $1.05 for wire, and 90 cts. for cut at mill, in carload lots.

BARBED WIRE.—Pittsburg: galvanized, $2.05; plain, $1.25 to $1.3 for carload lots at mill.

FOUNDRY AND PIG IRON.—New York: $10.50 to $13. Pittsburg: $10.75 to $12. Chicago: $9.50 to $10.50.

TRACK MATERIAL.—New York: angle bars, 1.25 to 1.4 cts.; spikes, 1.5 to 1.7 cts.; track bolts, 2 to 2.1 cts. with square, and 2.1 to 2.3 cts. with hexagon nuts. Chicago: angle bars, 1.25 to 1.35 cts.; spikes, 1.65 to 1.75 cts.; track bolts, 2.1 to 2.2 cts., with hexagon nuts.

RAILS.—New York: $24 at eastern mills and at tide water; old rails, $11.50 to $12 for iron and $9 to $9.50 for steel; steel rails, fit for relaying, $16 to $19; light rails, $22 to $24; girder rails, $24. Pittsburg: $24 for standard sections. Chicago: $25 to $27; old rails, $11 to $11.25 for iron and $7.75 to $10 for steel.

STRUCTURAL MATERIAL.—New York: beams, 1.35 to 1.5 cts.; channels, 1.4 to 1.5 cts.; angles, 1.3 to 1.35 cts.; tees, 1.5 to 1.6 cts.; universal mill plates, 1.25 to 1.35 cts.; steel plates, 1.3 to 1.4 cts. for tank, 1.4 to 1.5 cts. for shell, 1.6 to 1.65 cts. for flange, 1.75 to 2 cts. for ordinary firebox, 2 to 2.25 cts. for locomotive firebox. Pittsburg: beams, 1.25 to 1.35 cts.; channels, 1.25 to 1.35 cts.; angles, 1.15 to 1.25 cts.; tees, 1.4 to 1.5 cts.; universal mill plates, 1.15 to 1.25 cts.; steel plates, 1.15 to 1.25 cts. for tank, 1.3 to 1.4 cts. for shell, 1.35 to 1.45 cts. for flange, 2.5 to 3.5 for ordinary firebox, and 3.35 to 3.5 cts. for locomotive firebox. Chicago: beams, 1.45 to 1.5 cts.; channels, 1.45 to 1.5 cts.; angles, 1.4 to 1.45 cts.; tees, 1.65 cts.; universal plates, 1.4 to 1.45 cts.; steel plates, 1.4 to 1.5 cts. for tank, 1.5 to 1.6 cts. for shell, 1.65 to 2.1 cts. for flange, 1.65 to 5 cts. for firebox.

CAST IRON PIPE.—The "Iron Age" says that a notable revival in business has taken place in the Western cast iron pipe trade. It appears to have begun in July, gathered force in August and is now swinging along with something of its old time vigor. The foundries of the West and South, which supply this trade, have filled up with orders until quite a number of the principal establishments are unable to promise deliveries within 90 days. As a natural consequence of this activity prices have stiffened, and an advance of at least $2 per ton has been made on the rates ruling in the early summer. Purchasers of pipe who were unwilling or unable to supply themselves while extremely low prices were prevailing have lost their opportunity.

INDUSTRIAL NOTES.

DREDGE.—A dredge for excavating phosphate rock is wanted by Mr. E. B. Bailey, of Albion, Fla.

THE SCRANTON ELECTRIC CONSTRUCTION CO., of Scranton, Pa., has been incorporated to carry on a general business in engines, dynamos, motors, electric mining drills, etc., with offices in the Commonwealth Building, Scranton, Pa. Engr. and Man., Frederick J. Platt.

THE VULCAN IRON WORKS CO., of Toledo, O., reports that one of its "Giant" steam shovels used at the Mountain iron mine, Michigan, has recently made a record of 143 cars loaded in ten hours. About three hours are stated to have been lost in waiting for cars.

THE MADISON CAR CO., of Madison, Ill., has been reorganized, and the works have been started up. President, M. Ramsey; Vice-President, C. D. McClure; Treasurer, Paul A. Fusz; Secretary, A. P. Brigham. The first work of the company will be to build 100 coal cars for the St. Louis & Eastern Ry.

THE NATIONAL SWITCH & SIGNAL CO., of Easton, Pa., has just closed two contracts through Mr. Geo. Gibbs, Mechanical Engineer of the Chicago, Milwaukee & St. Paul Ry., for interlocking two crossings of that line with electric street railway lines in Chicago. The Gibbs' system for cutting out the current on the electric railways when the crossing is open for the steam railway, as described in our issue of Feb. 22, is to be installed.

THE BUFFALO ENGINEERING CO., of Buffalo, N. Y., announces that Mr. Kennerley Bryan, late engineer of Otis Bros. & Co., of New York, has become associated with the company. It has relinquished the sales agency for Otis Bros. & Co., and has arranged to represent the Winslow Bros. Elevator Co., of Chicago, as general agent for the sale of elevators and hoisting machinery. In addition it has undertaken the sale of ornamental iron for the latter company.

NEW COMPANIES.—Forged Steel Car Wheel & Locomotive Wheel Co., Trenton, N. J.; $400,000; James A. Facer, H. F. McCann and John McNeill, of Philadelphia.—Rockwell Construction Co., Paterson, N. J.; $30,000; Wm. B. Rockwell, B. H. Throop and M. J. Wightman, Scranton, Pa.—Pyrotechnic Railway Danger Signal Co., St. Georges, N. Y.; $100,000; A. M. Fox, D. H. Roberts and W. F. Seeley.—Construction Co. of New Jersey, Paterson, N. J.; $27,000; Chas. A. Johnson, Brooklyn, N. Y.; Frank Erving, Jersey City, N. J.; J. J. Scanlan, Paterson, N. J.—American Car Despatching Co., Chicago, Ill.; $100,000; J. L. McLean, M. J. Isaacs and R. L. Cressey.—Anti-Friction & Electric Car Wheel Co., New York, N. Y.; $1,000,000, commencing with $30,000; Charles Thompson, Oswego Falls, N. Y.; Eugene Mayne and John V. Loranger, New York, N. Y.—Hine & Robertson Co., Jersey City, N. J.; $25,000; steam engine specialties; James L. Robertson, Bergen Point, N. J.—Baer Double-Lock Wire Fence Co., Baltimore, Md.; $5,000; Martin H. Baer, J. H. Lesher and A. C. Strite.

TO WATER-WORKS CONTRACTORS.

Sealed proposals will be received at the office of B. F. Earl, Chairman of Committee on Water Supply of Niles, Berrian County, Michigan, until 7 o'clock p. m. on Tuesday, the 25th of September, 1894, for the construction of a system of water-works for said city.

Plans and specifications will be on file at the office of said Chairman of Committee, also at the office of the Consulting Engineer, Geo. W. Sturtevant, Jr., No. 804 Chamber of Commerce Building, Chicago, Ill., on and after September 18th, 1894.

Each proposal must be sealed, addressed to the Chairman of the Committee, Niles, Michigan, marked "Proposals for Water-Works Construction," and have inclosed a certified check payable to the City Treasurer, Niles, Michigan, for the sum of one thousand (1,000) dollars, as a guaranty that the bidder will enter into a contract for the construction of said works and furnish bonds within five days from date of award.

The city reserves the right to reject any or all bids.

Dated at Niles, Michigan, Sept. 7, 1894.

B. F. EARL, Chairman;
E. S. WILLIAMS,
C. RADEWALD,
A. F. BITHER,
Committee on Water Supply.

38-1t

STANDPIPE, MEDFORD, MASS.

City of Medford, Mass.—Sealed proposals for furnishing materials and erection of a 35 ft. × 60 ft. standpipe at Medford, Mass., will be received by the Water Commissioners at their office until 7 o'clock P. M., Monday, Oct. 1, 1894, at which time and place they will be opened. All bids must be accompanied by a certified check for $200, drawn on some National bank, made payable to the City Treasurer.

Plans and specifications may be had upon application at this office.

FRANK E. CHANDLER, Chairman.
T. HOWARD BARNES, City Engineer.

38 1t

WATER-WORKS AND ELECTRIC LIGHTING.

Plans and specifications for a water-works and electric light plant to cost about $12,000 will be on file in the Mayor's office on and after Sept. 26, 1894. Specifications will be sent to all that may request the same.

W. H. RUNKLE,
Mayor of Lisbon, Iowa.

38-1t

U. S. ENGINEER OFFICE, 121 Franklin St., Buffalo, N. Y., Sept. 14, 1894.—Sealed proposals will be received at this office until 2 p. m., Oct. 15, 1894, and then publicly opened for the hire of dredging plant; including a submarine drill boat; for use on the Niagara River, between Tonawanda and Port Day. For information apply to Major E. H. RUFFNER, Corps of Engineers. 38-3t

TREASURY DEPARTMENT, OFFICE SUPERVISING ARCHITECT, Washington, D. C., September 15, 1894.—Sealed proposals will be received at this office until 2 o'clock P. M. on the 12th day of October, 1894, and opened immediately thereafter, for all the labor and materials required for the excavation, foundations, basement and area walls, basement columns and I beams, etc., of first floor construction, temporary drainage, etc., for the United States Post Office building at Allegheny, Pa., in accordance with the drawings and specifications, copies of which may be had at this office, or the office of the Superintendent at Allegheny, Pa. Each bid must be accompanied by a certified check for a sum not less than two per cent. of the amount of the proposal. The right is reserved to reject any and all bids, and to waive any defect or informality in any bid, should it be deemed in the interest of the Government to do so. All proposals received after the time stated will be returned to the bidders. Proposals must be inclosed in envelopes sealed and marked "Proposal for the Excavation, Foundations, Etc., for the United States Post Office Building at Allegheny, Penn.," and addressed to JEREMIAH O'ROURKE, Supervising Architect. 38-2t

TREASURY DEPARTMENT, Office Supervising Architect, Washington, D. C., Sept. 10, 1894.—Sealed proposals will be received at this office until 2 o'clock p. m. on the 9th day of October, 1894, and opened immediately thereafter, for all the labor and materials required for a new building, etc., at the U. S. Marine Hospital, Vineyard Haven, Mass., in accordance with the drawings and specification, copies of which may be had at the office of the Custodian at Vineyard Haven, Mass. Each bid must be accompanied by a certified check for a sum not less than 2 per cent. of the amount of the proposal. The right is reserved to reject any and all bids and to waive any defect or informality in any bid, should it be deemed in the interest of the Government to do so. All proposals received after the time stated will be returned to the bidders. Proposals must be inclosed in envelopes sealed and marked "Proposal for a New Building, etc., at the U. S. Marine Hospital, at Vineyard Haven, Mass.," and addressed to JEREMIAH O'ROURKE, Supervising Architect. 37-2t

PROPOSALS FOR CONSTRUCTION OF dams and shore protections on Upper Mississippi River.—U. S. Engineer Office, Rock Island, Ill., Aug. 23, 1894.—Sealed proposals will be received here until 2 P. M., Sept. 22, 1894, and then publicly opened, for: 1. Construction of dams and shore protections between Genoa and Prairie du Chien, Wis.; 2. Construction of dams and shore protections between Glenhaven, Wis., and Dubuque, Ia.; 3. Construction of dams and shore protections between Dubuque and Clinton, Ia.; 4. Construction of dams and shore protections between Keokuk, Ia., and Quincy, Ill.; 5. Construction of dams and shore protections between Clarksville, Mo., and Hamburg, Ill.; 6. Construction of dams and shore protections between Hamburg, Ill., and Cap au Gris, Mo.; 7. Construction of dams and shore protections between Cap au Gris, Mo., and mouth of the Illinois River. All information furnished on application. 35-4t

U. S. ENGINEER OFFICE, CHARLESton-Kanawha, W. Va., August 21, 1894.—Sealed proposals for iron work for movable dams on the Great Kanawha River, embracing about 635,000 pounds of wrought iron and 337,000 pounds of cast iron, will be received at this office until September 27, 1894, 2:30 p. m., standard eastern time, and then publicly opened. Specifications, blank forms and all available information furnished on application to ADDISON M. SCOTT, Resident Engineer at the above office. WM. P. CRAIGHILL, Colonel Corps of Engineers. 36-3t

U. S. ENGINEER OFFICE, NORFOLK, Va., Sept. 11, 1894.—Sealed proposals for dredging in harbor at Norfolk, and its approaches, Virginia, will be received at this office until 12 o'clock, noon, Oct. 11, 1894, and then publicly opened. All information will be furnished on application to this office. EDWARD BURR, First Lieut. Corps of Engineers, U. S. A. 37-4t

U. S. ENGINEER OFFICE, NORFOLK, Va., Sept. 11, 1894.—Sealed proposals for dredging in Nansemond River, Va., will be received at this office until 12 o'clock noon, Oct. 11, 1894, and then publicly opened. All information will be furnished on application to this office. EDWARD BURR, First Lieut. Corps of Engineers, U. S. A. 37-4t

U. S. ENGINEER OFFICE, 601 EIGHteenth St., N. W., Washington, D. C., Sept. 4, 1894.—Sealed proposals for furnishing building stone, riprap stone, and for dredging in Potomac River, will be received here until 12 M. Thursday, October 4, 1894, and then publicly opened. All information furnished on application. CHAS. E. L. B. DAVIS, Major Engrs. 36 4t

U. S. ENGINEER OFFICE, 601 EIGHteenth Street, N. W., Washington, D. C., Sept. 17, 1894.—Sealed proposals for dredging in Occoquan and Aquia Creeks, Va., will be received here until 12 M., Wednesday Oct. 17, 1894, and then publicly opened All information furnished on application. CHAS. E. L. B. Davis, Major Engrs. 38-4t

U. S. ENGINEER OFFICE, ARMY BUILDing, New York, Sept. 10, 1894.—Sealed proposals for dredging Red Hook Shoal, in Buttermilk Channel, New York, will be received here until 12 M., Oct. 11, 1894, and then publicly opened. All information will be furnished on application. ROBERT McGREGOR, 2d Lieut., Corps of Engrs. 38-4t

U. S. ENGINEER OFFICE, 9 PLEASANT Street, Baltimore, Md., Sept. 11, 1894.—Sealed proposals for dredging in the Ship Channel leading to the harbor of Baltimore will be received until noon of October 11, 1894, and then opened. For information apply to WILLIAM P. CRAIGHILL, Colonel Corps of Engineers, U. S. A. 38-3t

U. S. ENGINEER OFFICE, 601 EIGHteenth street N. W., Washington, D. C., Sept. 17, 1894.—Sealed proposals for furnishing riprap stone at Occoquan Creek, Va., will be received here until 12 M. Wednesday, October 17, 1894, and then publicly opened. All information furnished on application. CHAS. E. L. B. DAVIS, Major Engineers. 38-4t

U. S. ENGINEER OFFICE, 601 EIGHteenth St., N. W., Washington, D. C., Sept. 4, 1894.—Sealed proposals for dredging in York River, Va., will be received here until 12 m. Thursday, Oct. 4, 1894, and then publicly opened. All information furnished on application. CHAS. E. L. B. DAVIS, Major Engrs. 36-4t

U. S. ENGINEER OFFICE, 601 EIGHTeenth St. N. W., Washington, D. C., Sept. 4, 1894.—Sealed proposals for dredging at Nomini and Lower Machodoc Creeks, Va., will be received here until 12 M., Thursday, October 4, 1894, and then publicly opened. All information furnished on application. CHAS. E. L. B. DAVIS, Major Engrs. 36-4t

U. S. ENGINEER OFFICE, NASHVILLE, Tenn., Aug. 25, 1894.—Sealed proposals for supplying stone for building lock No. 2 on Cumberland River will be received here until 12 m. Tuesday, Sept. 25, 1894, and then publicly opened. All information furnished on application. JOHN BIDDLE, Captain Corps of Engineers. 35-4t

U. S. ENGINEER OFFICE, 2258 WABASH Avenue, Chicago, Ill., September 5th, 1894.—Sealed proposals in triplicate will be received here up to noon, Central time, September 25th, 1894, and then publicly opened, for the following river and harbor work. Chicago Harbor: Exterior Breakwater, rebuilding and repair of superstructure. Calumet Harbor: Rebuilding superstructure of piers. Calumet River: Dredging above and below the Forks. All information furnished on application. W. L. MARSHALL, Capt. Engrs. 36-3t

U. S. ENGINEER OFFICE, BURLINGTON, Vt., Sept. 5, 1894:—Sealed proposals in triplicate, for dredging in Great Chazy River, N. Y., will be received here until 2 P. M., Oct. 5, 1894, and then publicly opened. Full information furnished on application to SMITH S. LEACH, Captain Engineers. 36-4t

U. S. ENGINEER OFFICE, BURLINGTON, Vt., Sept. 5, 1894.—Sealed proposals in triplicate, for rock excavation in Otter Creek, Vt., will be received here until 2 P. M., Oct. 5, 1894, and then publicly opened. Full information furnished on application to SMITH S. LEACH, Captain Engineers. 36 4t

U. S. ENGINEER OFFICE, BOSTON, Mass., Sept. 8, 1894.—Sealed proposals for dredging in Weymouth River, Mass., will be received here until noon, Oct. 8, 1894, and then publicly opened. All information furnished on application. S. M. MANSFIELD, Lieut.-Col. Eng'rs. 37-3t

U. S. ENGINEER OFFICE, BOSTON, Mass., Sept. 4, 1894.—Sealed proposals for delivery of rubble-stone in breakwater at Gloucester Harbor, Mass., will be received here until noon, Oct. 4, 1894, and then publicly opened. All information furnished on application. S. M. MANSFIELD, Lieut.-Colonel Engineers. 36-3t

U. S. ENGINEER OFFICE, BURLINGton, Vt., Sept. 5, 1894.—Sealed proposals in triplicate for repairs to Burlington Breakwater, Vt., will be received here until 2 P. M., Oct. 5, 1894, and then publicly opened. Full information furnished on application to SMITH S. LEACH, Captain Engineers. 36-4t

U. S. ENGINEER OFFICE, BURLINGTON, Vt., Sept. 5, 1894.—Sealed proposals in triplicate for dredging in Ogdensburg Harbor, N. Y., will be received here until 2 P. M., Oct. 5, 1894, and then publicly opened. Full information furnished on application to SMITH S. LEACH, Captain Engineers. 36-4t

U. S. ENGINEER OFFICE, BOSTON, Mass., Sept. 4, 1894.—Sealed proposals for dredging in Powou River, Massachusetts, will be received here until noon, Oct. 4, 1894, and then publicly opened. All information furnished on application. S. M. MANSFIELD, Lieut.-Colonel Engineers. 36-3t

U. S. ENGINEER OFFICE, BOSTON, Mass., Sept. 4, 1894.—Sealed proposals for the delivery of Rubble-stone in the south jetty at Newburyport Harbor, Mass., will be received here until noon, Oct. 4, 1894, and then publicly opened. All information furnished on application. S. M. MANSFIELD, Lieut.-Colonel Engineers. 36-3t

U. S. ENGINEER OFFICE, Savannah, Ga., Aug. 29, 1894.—Sealed proposals for constructing jetties at Cumberland Sound, Ga., will be received here until 12 M., city time, Sept. 29, 1894, and then publicly opened. All information furnished on application. O. M. CARTER, Capt. Corps of Engrs. 37-3t

U. S. ENGINEER OFFICE, BOSTON, Mass., Sept. 8, 1894.—Sealed proposals for the delivery of rubble stone at Scituate Harbor, Mass, will be received here until noon, Oct. 8, 1894, and then publicly opened. All information furnished on application. S. M. MANSFIELD, Lieut.-Col. Eng'rs. 37-3t